APRIL, 1964

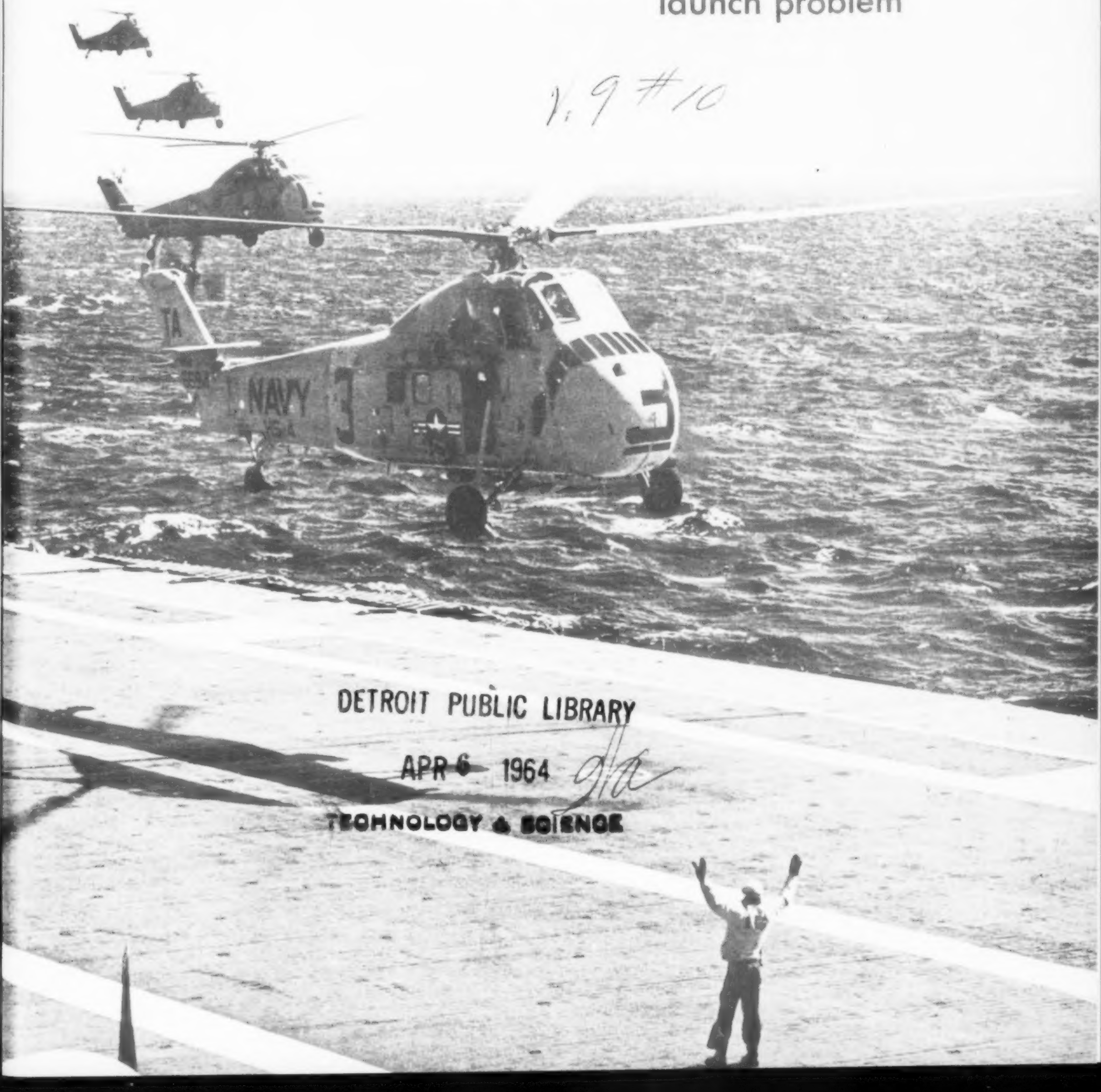
approach

THE NAVAL AVIATION SAFETY REVIEW

MOMENT OF TRUTH, lost tail rotor thrust

PROGRESS REPORT, a current launch problem

V. 9 #10



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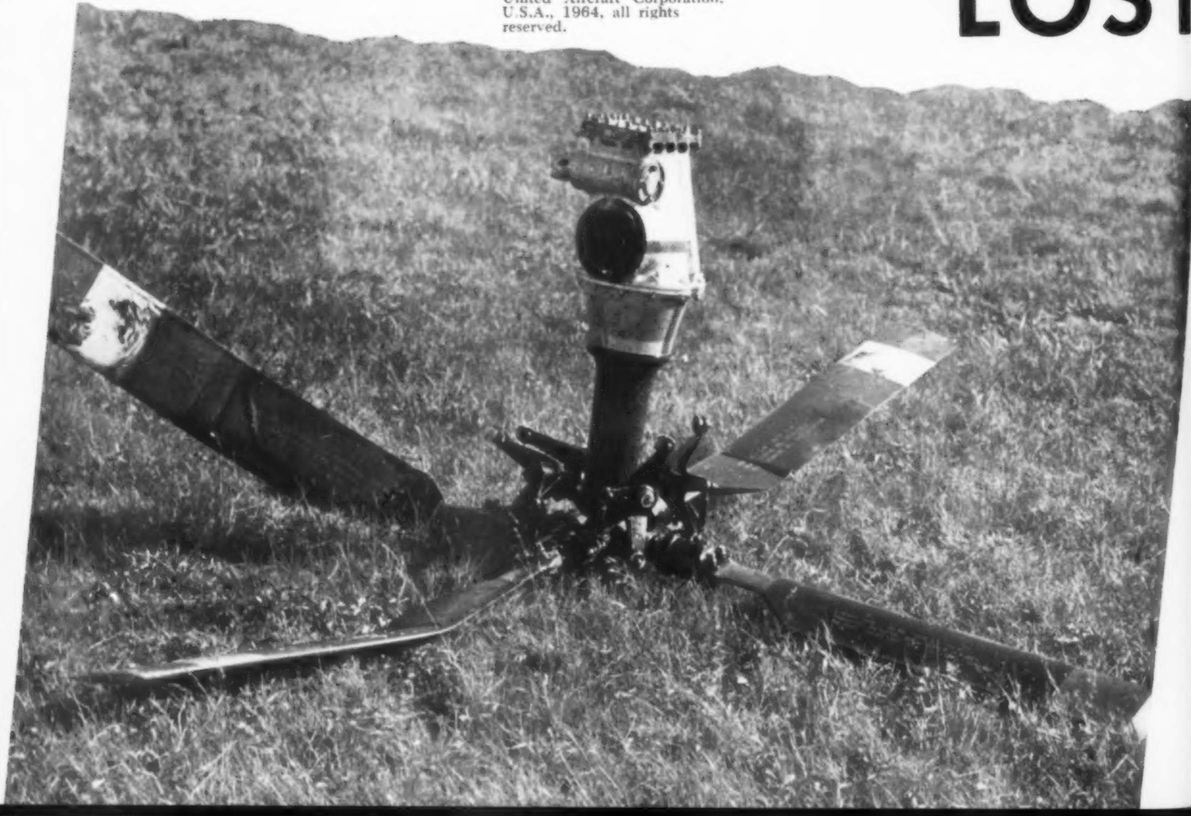


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By Robert Perrone

TAIL ROTOR THRUST

For many years pilots of single rotor helicopters were told that an immediate autorotation was the only way of maintaining directional control following a tail rotor malfunction which results in loss of tail rotor thrust. This was sound advice considering the fact that removing the main rotor torque eliminates the primary reason for having a tail rotor; however, because the terrain over which helicopters operate is many times unsuitable for an immediate landing, it would be advantageous if flight could be continued until a suitable landing site could be located.

A few years ago several instances were recorded in HRS/HUS model helicopters where tail rotor thrust was lost over hazardous terrain, and the pilots managed to remain airborne until more favorable terrain for landing was located. Citing these as examples, the U.S. Naval Aviation Safety Center recommended to BuWeps that a review of Flight Manual emergency procedures for tail rotor malfunctions be conducted. BuWeps' action resulted in a program of analytical study and flight testing by Sikorsky Aircraft Division of the United Aircraft Corporation.

The objectives of this program were to improve the emergency procedures to be employed in the event of loss of tail rotor thrust, and to develop design criteria for future helicopters which would increase flight safety in such a situation.

The flight tests were designed to evaluate the flight characteristics of the SH-34J[1] while flying with a condition of *zero tail rotor thrust*.

The knowledge gained from this evaluation is now reflected in forthcoming Flight Manual revisions, and quantitative flight test data will be used to substantiate analytical data obtained from theory and wind tunnel testing. A discussion of the flight test program and its results is herein offered as an aid to a better understanding of this emergency situation.

In this flight test program, a condition of zero thrust was achieved by taking advantage of the

1 Flight characteristics of the SH-34J mentioned in this treatise are typical for all designations of the Sikorsky S-58 helicopter.

Fig. 1

relationship between coning angle and thrust in the semiarticulated tail rotors of the test helicopters.

As a tail rotor produces thrust by accelerating a mass of air through the rotor disc, the blades are allowed to cone about flapping hinges to reduce blade bending — the magnitude of coning angle being directly proportional to tail rotor thrust. A rotary transformer was attached to the flapping hinge of each tail rotor blade to provide an electrical means of measuring coning angle and indicating a *relative* value of this quantity on a gage labeled Coning Angle Indicator attached to the pilot's instrument panel.

To establish the indication of ZERO thrust on the coning angle indicator, the airflow through the rotor disc was utilized. The helicopter was turned up to operating rpm on the ground and headed into the wind. Tail rotor pitch was varied with pedal application until a crewman, watching the reaction of tufts of wool taped to the trailing edge of the tail pylon, signaled that no air was flowing through the disc.

With the pedals in NEUTRAL, the direction of the thrust vector was to the right and the tufts were streaming to the left (Figure 1). Right rudder pedal application reduced both the thrust vector and the flow of air through the disc.

Continued right rudder pedal application reduced the thrust vector to zero and then caused it to increase to the left as indicated by the shift in direction of the tufts to the right (Figure 2).

Some left rudder pedal was then applied until the tufts hung limp or streamed aft, depending upon the wind velocity at the time (Figure 3). Thrust, coning angle and airflow were now all very close to zero. The reading on the coning angle indicator was noted and used throughout the program as the indication of zero thrust in flight.

The ability to establish and hold a condition of zero thrust from the tail rotor had now been attained; all that was needed to commence these tests was some additional test equipment to provide necessary information to the pilot: a sideslip vane and swivel head pitot-static tube which were mounted on the end of a boom attached to the nose of the helicopter.

The first objective was to determine if the test helicopter, an SH-34J, could be flown *in level flight* without the aid of the tail rotor to counteract main rotor thrust. The SH-34J *could.*

Fig. 2

Fig 3

Maintaining level flight implies that the engine is driving the main rotor, and therefore main rotor torque is tending to rotate the fuselage in the opposite direction to that of the main rotor (nose *right*).

If the SH-34J could be flown in level flight without tail rotor thrust, how was the main rotor torque being counteracted? The agent that performed this function was the fuselage.

This conclusion may be apparent from the following explanation of the procedure which was used with the SH-34J during the initial flights of this program:

1. An autorotation was established at 60 knots.
2. The pedals were positioned until the coning angle indicator read the predetermined value of zero coning (as you might expect, the flight attitude had all the appearances of a normal autorotation).
3. Engine power was reapplied, holding the pedals fixed.
4. Left, forward cyclic was applied to maintain a straight flight path.

When power was reapplied and the nose yawed to the right, the coning angle indicator showed a build-up of coning angle in the same direction that existed in normal, powered flight. This illustrated that at a fixed pitch setting, the tail rotor develops thrust when moved through the air at some angle to the relative wind (sideslip angle). At any given power setting, up to that required for level flight, the helicopter stabilized in a sideslipped condition and the coning angle indicator showed that the tail rotor was developing thrust. Both the sideslip angle and the coning angle indication were proportional to the power being applied. To return to a zero thrust condition, right rudder was applied until the coning angle indicator again read the value for zero coning. A new stabilized flight condition resulted, but this time at a much larger sideslip angle. Since the helicopter was again in equilibrium, i.e., it was not pitching, rolling or yawing, the fuselage must have been developing a turning moment that counteracted the effect of main rotor torque.

On the following page (Figure 4), a top view of the helicopter illustrates a stabilized flight condition with zero tail rotor thrust. The helicopter is flying with a left sideslip angle. With the net

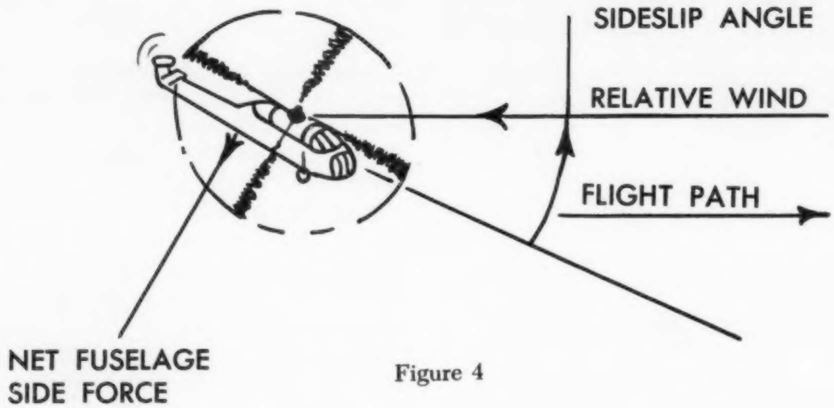


Figure 4

fuselage force located behind the main rotor shaft or vertical axis, the nose will tend to rotate back to the left, counteracting main rotor torque. On a given helicopter fuselage, the magnitude of the net fuselage side force varies directly with sideslip angle and the square of airspeed. For any given airspeed and sideslip angle, the magnitude and location of the net fuselage side force will vary with different fuselage shapes. If the net fuselage side force falls in front of the helicopter's vertical axis, the resulting turning moment on the fuselage will tend to rotate the nose further around to the right.

The following table (Figure 5) shows various level flight trim conditions for the SH-34J (Rotor RPM is equivalent engine speed):

Because the net fuselage side force varies directly with the square of airspeed, it is necessary to hold a reasonably high value of airspeed (between 60 and 80 knots) to maintain positive control over main rotor torque. In the absence of a reliable airspeed indication, this information must be provided by other instruments: the VGI, the turn and slip indicator and the rate of climb indicator.

The flight path airspeed can be maintained between 60 and 80 knots if the helicopter is rolled 15 degrees to the left, the rate of climb indicator is on zero, and the turn needle of the turn and slip indicator is vertical. This airspeed range is considered to be optimum for this flight condition from the standpoint of controllability and

Figure 5

Flight Path Airspeed, Kt	Sideslip Angle, Deg.	Roll Angle, Deg.	Rotor RPM	Test Day MAP, in. Hg.	Gross Wt. Lb.
40	90 (left)	10	2500	31	11,000
60	60 (left)	13	2500	33	11,000
80	45 (left)	16	2500	37	11,000

It is important to note that the airspeed system of the SH-34J ceases to function with any degree of accuracy at sideslip angles greater than 30 degrees. The indication falls off toward zero as sideslip angle increases past 30 degrees, reaching a steady zero reading at approximately 60 degrees. Between 45 degrees and 60 degrees, the airspeed needle will bounce between zero and 30 knots. (The airspeed shown in Figure 5 was measured with the swivel head pitot-static tube which streamed into the relative wind and functioned satisfactorily up to 90 degrees of sideslip).

power remaining for climbing.

Turns can be made easily with small amounts of lateral cyclic pitch control. Increasing the bank angle will cause the helicopter to turn to the left, while decreasing the bank angle will cause the helicopter to turn to the right. At large sideslip angles, however, it is difficult to perceive low rates of turn and frequent reference must be made to the turn needle. In fact, when trying to fly a straight flight path, a conscious effort is required to keep the aircraft from describing a large, circular path to the right because insufficient left roll is being developed. Caution should

be exercised when a right turn is made as a planned maneuver because of the possibility of moving the cyclic stick *aft* as it is moved right, and in so doing, reducing the airspeed. If it is felt that airspeed is dropping off, apply left, forward cyclic to stop the turn and lower the nose.

At airspeeds below 40 knots, the turning moment produced by the net fuselage side force is not sufficient to completely counteract large values of main rotor torque, and the fuselage will rotate past 90 degrees of sideslip angle. As it does the nose will start to tuck under because of main rotor hub moments which are developed as the blades flap upward over the tail cone, which is now becoming the front of the helicopter in relation to the flight path. The rotation can be almost completely stopped by lowering the collective to its low pitch stop, and the nose can be prevented from tucking any farther with some aft cyclic stick. The helicopter will then accelerate in a 10 – 15 degree nose-down attitude. The sideslip angle will be close to zero, and the airspeed system will start functioning normally again. As the airspeed passes through 60 knots, power can be reapplied to regain level flight. As sideslip angle develops, left lateral cyclic is coordinated to keep the turn needle centered.

The SH-34J was not only capable of maintaining level flight without the aid of the tail rotor, but it could also climb in this condition. Approximately 350 feet per minute rate of climb was developed at 60 knots flight path airspeed with max continuous power for 2500 engine rpm. The increase in slideslip angle at the climb power setting was very small and without a sideslip indicator would have been undiscernable by the pilot.

At airspeeds between 40 and 90 knots, tail rotor thrust was abruptly reduced to zero in level flight and an effort was made to keep altitude loss to a minimum during these maneuvers. Power was therefore *added* simultaneously with thrust reduction. This action kept the altitude loss to approximately 10 feet as read on a radar altimeter. No rapid or large cyclic stick motions were required to control the helicopter during any of these maneuvers. Left, forward cyclic motion was applied as the nose began to yaw to maintain airspeed and a straight flight path.

The landing should be made in full autorotation, securing the engine when the landing spot is assured. (Landing with power was evaluated, and it was concluded that the possibility was very high that the helicopter would incur severe damage on touchdown because of the attendant sideslip angle). The airspeed system will be functioning in the descent and an indicated 60 knots should be held. If the landing area is a level, paved surface, a run-on landing between 20 and 30 knots can be easily accomplished. If the field is unprepared, start to flare about 75 feet, holding it so that forward ground speed is at a minimum when the aircraft reaches 10 to 20 feet. A rapid collective pull just prior to touchdown in a level attitude will complete a successful handling of a difficult emergency situation.

Remember! If tail rotor thrust is lost – and this is true for any single rotor helicopter with blade rotation to the left as seen from the cockpit – the nose will swing to the *right*. But, in helicopters equipped with boosted tail rotor control and automatic stabilization equipment, a right ASE yaw hardover or a tail rotor servo malfunction which drives the right pedal forward can also swing the nose to the right, so a rapid assessment of the actual malfunction is necessary. The ASE hardover is readily overcome with about 20 to 40 pounds of force on the left pedal. A partial or total failure of the tail rotor servo will restrict or impede the motion of the left pedal. Turning off the auxiliary servo should immediately restore tail rotor control. A drive shaft failure will usually allow normal pedal motion, but the aircraft will show no response to this motion.

Therefore, if tail rotor thrust is lost in forward flight, the SH-34J type pilot will have the assistance of fuselage turning moments to prevent excessive yawing while he determines his situation, and no rapid control motions are required.

In a hover the test helicopter – along with all other single rotor helicopters – react in a similar manner when tail rotor thrust is lost. Without the benefit gained from forward airspeed, a single rotor helicopter fuselage cannot produce turning moments which could even begin to counteract the main rotor torque which is developed in a hover.

If the nose begins to spin to the right in a hover, rapidly determine that the ASE or yaw servo is not the culprit, and then take one of the following courses of action:

- Split the needles, hold the helicopter level and cushion the landing with collective pitch. (This procedure worked out extremely well in a CH-37 in which I was flying as copilot a few years ago. A drive shaft failure in a 30 – 40 foot hover over a paved surface provided me with a ringside seat to see this procedure put to the acid test. A loud snapping noise, followed by rotation of the nose to the right signaled our plight. Although a hard push moved the left pedal, the fact that the aircraft did not respond told the pilot he had lost tail rotor thrust. He immediately closed the twist grip, splitting away both engines. Even then the rotation continued because of the inertia that had been built up during the short time it took to mentally assess the situation, and I can remember viewing the ground with alarm as we spiraled toward it. The pilot held the fuselage pretty level, and to my amazement the landing was quite soft; the right wheel broke at the axle and the helicopter rotated to a stop on the landing gear shock strut. Neither myself, the pilot nor two wide-eyed engineers riding in the cabin, were injured in any way. While I'm hoping this incident will be *it* for me, I would not hesitate to use this method if I had to make a choice.)
- Lower the collective to give a slow rate of descent and land with power. While I would not recommend this course of action, it has also been found to be satisfactory, at least in one particular incident. A Navy pilot landed with power after losing tail rotor thrust in a hover. The helicopter, an SH-34J, started to tip "but is was snatched back into the air and landed a second time with a little more finesse." (Whew!)

Another possible method, which was considered, of coping with a loss of tail rotor thrust in a hover, is to accelerate, while spinning, along a straight flight path until the fuselage counteracts the main rotor torque. Use of this method, of course, presupposes a knowledge that the helicopter can be flown in level flight without tail rotor thrust. After determining that the SH-34J did have this level flight capability, an abortive attempt was made to evaluate the merit of this method with only one third of the tail rotor thrust required to hover removed. The extremely high yawing rate – nearly 180 degrees/sec. – that develops when *all* thrust is lost in a hover makes it impractical to attempt this possible choice in the SH-34J. Not only could the pilot become completely disoriented, but the engine cooling fan can be overstressed and possibly break from the high gyroscopic forces that will develop with this yawing rate.

In conclusion, I would like to outline a procedure for becoming acquainted with the flight condition that results in the subject helicopters with tail rotor thrust near zero. (A similar procedure was outlined in an APPROACH article entitled, "Unhappy Turn" by LCDR. J. B. Gilstrap February 1962.) *[Ed's note: The subject was further discussed in the July '62 issue]*

A long straight road is required and about 1500 feet of altitude. Determine the magnetic heading of the road.

With the SH-34J (S-58):

- Fly directly along the road at 70 knots.
- Slowly apply right rudder and left cyclic to keep your flight path along the road until you have changed heading 50 degrees.
- Increase power to maintain level flight.

You now know some of the theoretical and practical aspects of the subject of tail rotor failures. I hope you will never need to use this knowledge. However, in addition to having skill – and luck – a pilot must be well informed to be able to cope with the varied demands of the increasingly complex modern helicopters.

Good Luck! Keep those tail rotors turning!

About the Author —
Mr. Robert Perrone was graduated from Purdue University in 1951 with a B.S. in Aeronautical Engineering and immediately entered the U.S. Marine Corps. After Serving in several ground aviation billets, he entered flight training in 1953 and received his wings at Pensacola, Florida in 1954. The next two years were spent in Marine helicopter squadrons flying primarily HRS helicopters. He was released from active duty in 1956 as a Captain and joined the Flight Test staff at Sikorsky Aircraft where he is currently a member of the Experimental Flight Test Section. Mr. Perrone is a 1962 graduate of the U.S. Naval Test Pilot School, NATC, Patuxent River, Maryland.

OPS NOTES

EXCERPTS FROM SOME OF THE NAVY'S SAFETY COUNCILS THROUGHOUT THE WORLD, WHO PROVIDE LOCAL LEADERSHIP AND EMPHASIS TO THE NAVAL AVIATION SAFETY PROGRAM.

Colored Light

A distinctive colored light in the center of the bow lights has been requested as an aiming point in night deck runs for the A-1Hs. The Air Officer will see that this is done. — USS ROOSEVELT

Reflective Tape

Reflective tape should be used where possible on the flight deck to mark items such as the outboard rails on No. 2 elevator, elevator stanchions and elevator guard rails. — USS KEARSEARGE

Training

The old problem of recoordinating combined ship and group operations for the first time since deployment with a vast number of new personnel was discussed. It was agreed that intensive training, with emphasis on safety, during this 3-week MidPac cruise would pay handsome rewards in future operations. —*USS* HANCOCK

Cross-Check Charts

During a recent flight in Spain a C-117D was proceeding to Barcelona on B-31 at 9,000 feet. The Flip Enroute chart showed Minimum Enroute Altitude for the next segment to be 11,000. Upon requesting 11,000 ft. the pilots were informed by Air Traffic Control that the Minimum Enroute Altitude was 13,500 feet. After landing it was determined that the Enroute chart was in error. The moral: Don't depend upon ATC for safety of your flight—Cross-check Enroute charts with WAC charts when flying in an unfamiliar area.—*Northern ELM*

Near Misses

There have been three near miss incidents reported in the past six months. In all three cases one aircraft was on a radar controlled approach (VFR) and the other was local VFR traffic. It would appear that in these cases the aircraft under radar control (VFR) was relying entirely on radar for aircraft separation. It should be realized by all pilots that while operating under VFR conditions it is the responsibility of the *pilot* to maintain his own separation at all times. Radar is an advisory service only. — *NAS Twin Cities*

NATOPS

NATOPS is not designed to replace a pilot's judgment. An example of this is frequently noted in the single engine procedure in the S-2. The check list calls for propellers to full increase RPM. If, at cruising or near cruising speed you should suddenly advance the propeller lever to full increase RPM you will induce a propeller overspeed. To inflict this type of punishment on your only remaining engine is not good judgment. If altitude permits and airspeed is comfortable let's advance the propeller pitch slowly enough to preclude engine overspeed. In many cases maximum RPM may not be needed at all. Let judgment supplement standardization instead of being a slave to it. —*NARTC*

F-8 aircraft with integral fittings, properly seated, tensioned for catapult launch.

Integral Tension Bar Retainers

A Progress Report

By LT J. J. Mulquin

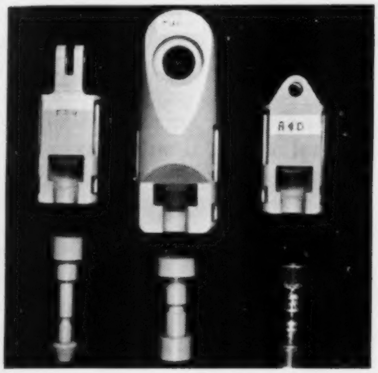
With the fleet introduction of carrier jet aircraft in the late 1940's, major changes became necessary in all phases of shipboard operation, especially launching and recovery procedures.

In an era that witnessed development of the angled deck, mirror landing devices, steam catapults and a family of 80,000-ton aircraft carriers, it may seem inappropriate to include the growing pains connected with launching hardware and accessories. Nevertheless, as mission requirements nudged aircraft gross weights further and further upward, and catapult launching became the rule rather than an exception, serious attention focused on this vital area.

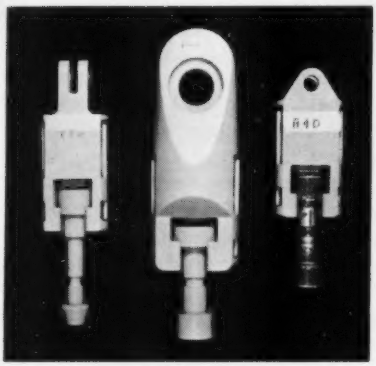
Difficulties

One factor in particular, the adoption of the tension bar for the majority of aircraft launches, brought with it a whole series of difficulties. These included:

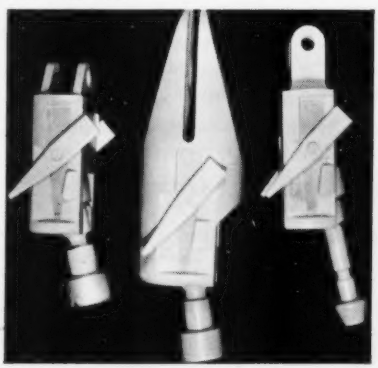
- **Use of the Wrong Tension Bar.** Tension bars were initially designed for a specific aircraft and any similarities occurred more through accident than intent. In a move toward component standardization and cost reduction, bars were later made dimensionally uniform, except for the necked-down area where separation occurs. This achieved its intended purpose, but at the same time, permitted the wrong bar to be accidentally inserted in a fitting, thereby altering the point of release. The consequence of using a larger bar



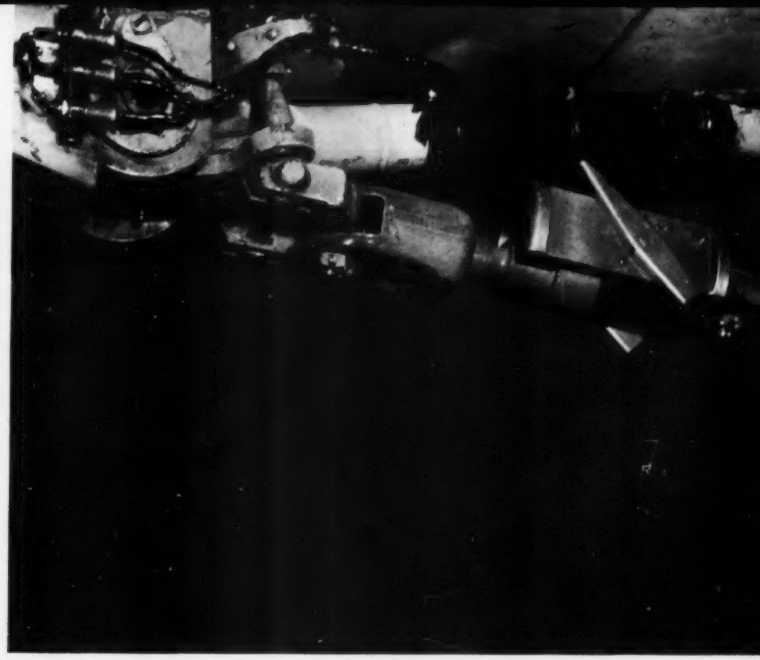
Typical integral deck holdback retainers and tension bars: (left to right) F-8, F-4B, A-4.



Typical integral deck holdback retainers with tension bars properly seated: (left to right) F-8, F-4B, A-4.



Typical integral deck holdback retainers and mispositioned tension bars: (left to right) A-4, F-4B, F-8: note flag positions.



Mispositioned tension bar in integral deck holdback retainer of A-4aircraft.

was either structural damage to the airplane or tensile failure of some launching component. Employing a smaller bar resulted in premature release of the aircraft in advance of the catapult stroke. Either could and did result in strikes and fatalities.

- **Tension Bar Mispositioning.** It was discovered that despite design changes and operational evaluations, it was possible to misposition a tension bar in either the deck holdback terminal or aircraft fitting. This condition, aggravated frequently by darkness and foul weather, defied visual detection. Often, the tension bar would seat itself during the tensioning sequence, permitting the aircraft to lurch forward sufficiently to drop the launching bridle or pendant, with obvious consequences. Occasionally, application of shuttle force caused the bar to eject itself from the fitting entirely.
- **Foreign Object Damage.** The first generation of tension bar fittings and terminals had no means of retaining a tension bar half after launch; halves were known to have bounced, bounded and careened down flight decks, striking personnel, smashing canopies, becoming ingested into engines and generally creating a most expensive and extremely hazardous nuisance.

Interim Solutions

As is frequently the case, a two-phase plan of corrective action was established, the first offering immediate relief through interim measures, and

the second designed to firmly resolve known difficulties permanently.

Since the design, development, test and production of new holdback terminals and aircraft fittings was recognized as a long-term, high-dollar program, immediate steps were taken at short range correction. Such actions, admittedly stopgap measures, resulted in a variety of developments, many of them presently in fleet use.

Decal tapes, each containing the designation of a particular aircraft and featuring its own distinctive color combination, were issued for application to appropriate tension bars. Embossed plastic strips, commercially available, were considered and subsequently rejected from a durability and visibility standpoint. Recommendations calling for distinctive paint on fittings and terminals were issued, thereby creating a visual compatibility between bar and receptacle. The use of clear vs colored-lens flashlights to facilitate night and poor weather identification was prescribed. A family of tension bar retainers, small metal spring clips or rubber pucks inserted between bar and receptacle, reduced the chance of both mispositioning and post-rupture escape.

Interim solutions were inexpensive, relatively effective, and involved little procurement lead time. Unfortunately, they were generally directed at only one specific aspect of the overall problem. In addition, they impose a certain supply/logistic burden due to their limited quantity and variety. Clearly, an ultimate solution was needed.

Ultimate Solution — the Integral Retainer

From the outset, agreement existed between the Bureau of Naval Weapons, operating commands and contractors that the final solution to the launching problem would consists of an integral aircraft fitting and integral holdback terminal, linked by a non-interchangeable tension bar. It should be emphasized that the word *ultimate* as herein employed, refers to methods and devices applicable to the present family of naval carrier aircraft. It does not include advanced concepts and techniques, specifically, nose gear launch, which incidentally, has been made a mandatory requirement for new carrier aircraft designs.

The basic integral retainer design, developed at the Naval Air Engineering Laboratory in Philadelphia, Pa., has proven most satisfactory under varying tests and conditions, and is presently being incorporated, with modifications, in fleet aircraft (ref: NATC(FT) Report RSSH-44-135, 19 December 1962). The integral fitting includes a manually-actuated handle or *flag* which is depressed to admit the tension bar, released when the bar is in position, and spring-loaded to insure retention of the bar half under post-launch impact and blast loads. The fitting is designed to accept the non-interchangeable tension bar for a specific aircraft and no other.

As added protection against mispositioning, the fitting handle, held in the OPEN position by an unseated tension bar, exposes a brightly-painted (Da-Glo) area of the fitting and serves to alert catapult hookup crews to the condition.

Integral retainers and non-interchangeable bars have been designed and prototyped for every principal carrier aircraft type. In some instances, integral equipment has been in fleet use for many months with very gratifying results. In other cases, individual problems have arisen and delay has naturally resulted. Despite temporary setbacks, however, integral development is progressing and the day is rapidly approaching when it will be incorporated throughout the fleet.

Current Status

In summary, the current status of the integral retainer program is as follows:

Lieutenant James J. Mulquin holds degrees in Pre-Law and Aeronautical Engineering. During the Korean conflict he served aboard submarines and amphibious ships of the Atlantic Fleet in the Arctic and Caribbean. Since 1958, he has specialized in the development of military equipment, both with private industry and the government. He was formerly marketing Research Manager of Washington Technological Associates, Inc., engaged in the design and production of shipboard missile components, Polaris handling equipment, and advanced underway replenishment systems for the fleet.

Lieutenant Mulquin is presently serving with the Ship Installations Office, Bureau of Naval Weapons.

• F-4B. After extensive testing by both the contractor and the Naval Air Test Center, the integral aircraft fitting has received preliminary approval and will shortly be scheduled for production incorporation. Field installation kits are to be made available for modification of delivered aircraft. Limited quantities of integral holdback terminals and non-interchangeable tension bars have recently been issued to operating commands.

• F-8. Integral aircraft fittings, introduced by ASC-415, have been in fleet use since the fall of 1962. Deliveries of integral holdback terminals and non-interchangeable tension bars were made during 1963 and will continue to enter the fleet at regular intervals.

• A-3B. An integral aircraft fitting is presently in fleet service. Testing has been conducted and is continuing, as design modifications to the integral deck holdback terminal improve its performance. The final version is expected to enter the fleet in the Summer of 1964.

• A-4. The first kits incorporating an integral aircraft fitting were delivered in the fall of 1962. At present, a modified design (ASC-192-1) is being installed on new aircraft, with kits available for backfit. Integral deck holdback terminals and non-interchangeable tension bars are being manufactured and delivered on schedule.

• A-5. Production aircraft are being delivered with the integral aircraft fitting of ASC-67 installed. Backfit kits were distributed during the spring and summer of 1963. It is anticipated that integral deck holdback terminals will be in the hands of operating activities by the summer, 1964, along with sufficient quantities of non-interchangeable tension bars.

As noted previously, newer aircraft including the A-6A, E-2A, F-111B and others, will employ nose gear launch exclusively. Briefly, under this system, the tension bar halves are retained after launch by spring-loaded fittings, both in the aircraft end and trail bar end. Interestingly, an early problem with this launching method was not *flying T-bars* but rather, airborne trail bars which at fifteen to twenty pounds, represented considerable mass flailing unescorted down the flight deck. This problem has now been corrected.

All problems have not been completely erased, but encouraging progress has been made. In short, the path to final, effective T-Bar retention has been cleared markedly during the past year and we can now realistically predict positive resolution in the immediate future.

People — A Progress Report

The Progress Report you have just read has set forth some advances in hardware. This is just one part of the story.

People play a paramount role in every successful cat shot and conversely, they sometimes are responsible for an unsuccessful one.

Quality Control in catapult launching is sometimes lacking. A pilot's life is in the balance for a few seconds everytime this evolution takes place. **USS BON HOMME RICHARD** obviously has quality control in attaining 50,000 accident-free catapult launches.

Hats off to **BONNY DICK's** crew — may their record be exceeded by themselves and all other carriers!

MY

Although this article deals primarily with eye fatigue reported by radar observers assigned to B-29 and B-50A crews, the general information is applicable to any near visual work required by radar operation in any aircraft.

The long range capability of medium and heavy bombardment aircraft coupled with the present day refueling technique has increased the requirements and the duration of our everyday missions.

Gone is the day when an observer could sit back while on a flight, daydream of Dagmar's virtues, smoke a cigarette, and wait for time to pass until the flight was closed out. Instead, routine missions today are choked with requirements encompassing all the phases of navigation and bombing, each requiring constant attention and application. As missions become more lengthy and observers grow older, "eye fatigue" may become a governing factor in the final results of an individual's bombing or navigational efforts.

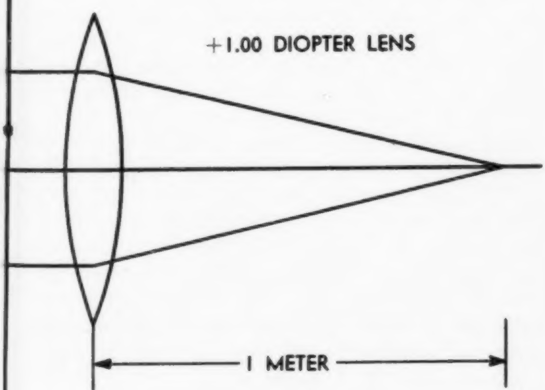
To repress this fatigue and to secure maximum visual efficiency for the radar observer, we must analyze the causes and examine the corrective possibilities open to us. To do this, we must first be aware of the lighting arrangement as well as the mechanical arrangement of the radar indicator; and, secondly, understand the function of the normal eye.

The normal eye can be thought of in terms of a camera in that both are light-tight and have an aperture for the entrance of light. Both the eye and camera contain a lens to focus light on their receiving back plates; in the camera, this is called a photographic plate, while in the eye it is known as the retina. A special characteristic of the eye, which the camera does not possess, is an ability to automatically and rapidly change its focus. In the human eye, there is an increase in focusing power caused by a change in the contour of the lens, which, in turn, is brought about by the interplay of certain intrinsic eye muscles. The amount of increase depends directly upon the nearness of the point of fixation. This phenomenon, the ability of the eye to focus automatically upon objects at different distances from it, is called accommodation, and has a direct bearing on eye fatigue. This ability or quality of the eye is measured in units known as "diopter," which may be defined as a unit describing the vergence of light.

The accepted average working distance for near point visual tasks has been placed at 16 inches measured from the eye. Considering the

ACHING EYES!

mechanical arrangements of the APQ-13 and APQ-23 radar scopes, the indicator screen is presented to the observer through a circular tube 7.25 inches in length and 5 inches in diameter. To the end of this tube is affixed an eye hood 5 inches in length to accommodate the observer's



eye plane and to afford physical comfort to the operator while viewing the screen. This places the eye at approximately 12 inches working distance from the radar screen. This shorter working distance now presented to the radar observer requires that a larger amount of accommodation be used during observation of the radar screen and results in early discomfort and eye fatigue. Let us consider a hypothetical "normal" eye which has a normal working distance of 16 inches and requires 2.5 diopters or units of accommodation to see an object clearly. At 12 inches, which represents the working distance during radar observation, the accommodation required to see the target screen clearly is 3.3 diopters. Current records show that a majority of observers possess a decree of far-sightedness (hyperopia) resulting in an accommodation requirement of approximately 4 diopters under present working conditions existing in the B-29 and B-50A. This difference of accommodation is one of the principal factors of eye fatigue. There are other contributing factors.

Consider now what is known as "amplitude of accommodation" and its relation to an observer's eye fatigue. The amplitude of accommodation may be defined as the difference between the focusing power of the eye when relaxed (focused for its most distant point) and when accommodation is exerted to its utmost (focused for the nearest possible point). Age and amplitude of accommodation vary inversely; i.e., the older the

radar observer is, the less is his amplitude of accommodation. This phenomenon, however, is considered normal. In youth, the lens of the eye is capable of an extreme amount of elasticity and the amplitude of accommodation is high. With advancing age there is a steadily decreasing amplitude of accommodation. In other words, with advancing age the nearest point of clear vision recedes. When the near point recedes to approximately 14 inches the individual is considered as entering the reading glass (presbyopic) stage. And as the process continues with increasing age, the near point recedes until it coincides with the point of the eye, the stage of zero amplitude of accommodation.

An unofficial survey conducted in the 43rd Bombardment Wing, SAC, showed that the average age of radar observers assigned to crews was 32.5 years. This age bracket medically permits the lowest amplitude for a crew member to be five diopters. This figure represents the "low" average accommodation power for age 32.5 years on standard tables. The "mean" accommodative power for this age is 8 diopters. Hence, a radar observer in this age bracket may have an amplitude of accommodation between 5 and 8 diopters. This range is considered normal, but the lower values approach the 3.3 diopters of accommodation required to see the screen clearly under present working distances without undue strain.

When the amplitude of accommodation is large, the observer will have a correspondingly large amount of accommodation in reserve; in the opposite case, he will be working too near the limit of his capacity for comfort. Like all other muscles, those producing accommodation become fatigued if, instead of working in relays, all its fibers are called upon to contract for any length of time. It has been estimated that in such circumstances, ⅓ of the total accommodative power must be held in reserve for visual comfort.

Presumably, therefore, those radar observers slightly older than 32.5 years, or with a slightly lowered amplitude of accommodation, will be working near the limit of their point visual capacity, resulting in a definite eye strain.

In relation to accommodation, oxygen deficiency also may bring about a rapid degree of eye fatigue. This is of particular importance at high altitudes for a considerable decrease in the amplitude of accommodation occurs above 16,000 ft. In addition, lighting, such as darkness or dim light, has an inhibitory effect on accommodation and can induce eye fatigue.

The radar observer is confronted with the problem of maintaining a reasonable state of dark adaptation. It is common knowledge that on entering from broad daylight into a dimly lighted room we are at first unable to see anything, but gradually the objects around us take form and finally we see well. It is also a familiar fact that on going into bright sunlight the glare blinds us and seeing is impossible until we have been subjected to the increased illumination for some time. We say the eye becomes accustomed or adapts itself to either a greater or lesser amount of light to which it was almost blind. This is known as retinal adaptation. When the eye becomes dark adapted, we speak of its vision as scotopic or twilight vision. The light adapted vision is called photopic or daylight vision.

The radar observer performs his tasks in reasonably dark surroundings, and keeping his eyes at an optimum level of adaption is a matter of great importance. When the observer has been at his position for approximately 30 minutes his eyes will be fully adapted to the degree of illumination he will experience. However, the observer must make frequent references from his scope to various charts and dials. These should be adequately illuminated to permit visibility and yet not have too high an intensity of illumination. If the observer uses a bright light to illuminate these charts or instruments, the adaption level of his eyes will shift towards daylight vision and will require some length of time to re-adapt towards night or dark vision. It takes about 10 times the length of time for the eyes to fully reach night adaption as it does to change from fully night adapted to fully daylight adapted vision; a ratio of perhaps 20 minutes to 2 minutes. An evenly diffused light source of proper light intensity to produce adequate visual acuity with reference to charts and instruments, and yet not seriously interfere with the adaptation state, represents the ideal condition.

Moreover, the observer should protect his eyes from all extraneous sources of bright light, especially during daylight flying. If the scanner's blister permits sunlight to enter the radar compartment — and it often does with changes of

headings — then adequate blackout curtains should be provided to eliminate this possibility. These extraneous sources of light are an unnecessary source of annoyance and result in mental and visual exasperation to the observer, not to mention temporarily reduced visual efficiency. It is readily apparent that if the observer is subjected to bright light during the critical stage of a bomb run, the result or score of the run may be seriously affected.

It can be gathered from the foregoing statements that the radar observer is subject to eye fatigue which may materially hamper his operational and visual efficiency. Although few corrective measures are presently possible, particularly regarding accommodation, it would greatly benefit the radar observer to acquaint himself with the problem of eye fatigue it causes, and the corrective measures possible to be taken to combat eye fatigue. This knowledge could pay dividends both in visual comfort and increased proficiency. The following measures are recommended:

- Constant use of the eye hood should be made to (a) provide physical comfort while viewing the screen, (b) provide the proper positioning of the eye plane in relation to the scope, and (c) assist in stabilizing the scope assembly.

- Eliminate extraneous light from entering the radar observer's compartment. This will permit or facilitate the observer's eyes to maintain a more constant level of adaptation.

- Use diffused light on maps and charts while viewing the radar screen, so as to eliminate large contrasts in intensity of light.

- Avoid oxygen deficiency. On all flights where cabin pressure is higher than 10,000 feet, use oxygen to avoid decrease in accommodation.

- Avoid rapid and large contrast in intensity of gain on the radar screen.

- Practice good eye hygiene.

Radar observers experiencing chronic visual complaints, ocular symptoms, or any subjective symptoms resulting from eye use should have an eye examination. If symptoms, usually in the form of headaches, redness of the eyes, blurred or blurring vision persist during scope observation or with any close eye work, it would be wise for the observer to check with the flight surgeon for an eye refraction and visual examination. Very often, small refractive errors of astigmatism or far-sightedness if corrected with lenses produce an amazing amount of comfort with close work. Good hygiene should be used at all times.

The radar observer's complaint "My aching eyeballs" can be substantially minimized by a little effort on the part of each observer.

USAF Navigator Vol. XI, No. 1

Good Eye Hygiene

- **Avoid overexposure to sun's rays — direct or indirect (beach, etc.).**
- **Avoid cheap glass or plastic lenses in sun glasses. Make sure quality is good.**
- **Avoid close work in subdued light — have adequate light, preferably from one side or the other.**
- **Do make sure on your annual physical your eyes are checked well. Last year's reading doesn't count.**
- **If any symptom arises about your eyes, see about it now.**

Please Do not Fold, Spindle, or Multilate

The reaction of the first pilot to stall a powered flying machine, while not recorded, was probably not too markedly different from that produced by the modern day inadvertent stall. Even with the vast wealth of repetitive experience and learning compiled since stall no. 1, the accidental stall still produces a fleeting sentiment akin to a "What the ding-dang?" á la brothers Wright or a "Quel fromage!" per M'sieur Bleriot. So much is supposedly known about the aerodynamic behavior of present day aircraft that a pilot is now considered in particularly poor taste if he permits his aerial steed to exceed the bounds of flyable flight. "Le grand goof", according to the société des aeronautiques.

In the days of unenlightened aerial endeavor, there were many goofs of startling magnitude that produced not only mere stalls, but also all manner of folding, spindling, and gross mutilation of aircraft and contents. This was costly and discouraged public affection. Aircraft were therefore built stronger and with greater propulsion, but the stalling and overstressing kept apace. One obvious solution was to induce all pilots to aviate their machines gently with a tender touch and no rude gestures. While this worked well with the Ladies Octogenarian Aero Club of Pasadena, it just didn't sell to the multitude of tigers in leather leggings and scarves. To be able to hold the floor at happy hour and to speak authoritively with one's hands, one must zoom, gyrate, and scorn the earthbound drawing board. Planes have continued to be stalled and overstretched up to this day.

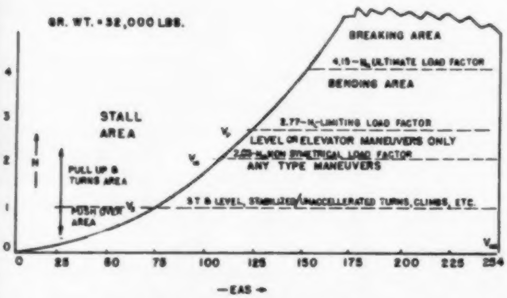
Wearying of the hard-knocks route, those in charge of pilots and airplanes beseeched the slide rule set to construct some form of graphic representation of aerodynamic operating limits that could be pasted onto the skulls of tigers and absorbed therein without diluting either the limits or the tigers. Thus emerged the Vn (Vg) diagram, or "flight envelope." This was not a new discovery, but its appearance into the daylight range of pilot comprehension was relatively sudden. And because of its belated public appearance, many of the straight-and-level club automatically assumed that it applied only to high performance single-occupant machines that messed around in something called Mach and approached in price the congressional payroll. After all, how can you overstress a big multi-fan machine if it's going to overstress the pilot first? Pilot stall precludes airplane stall. So the thinking goes, and it is entirely wrong. Each type machine has its individual Vn diagrams, and there are situations and circum-

stances where a lack of interest in such matters can lead not only to "le grand goof," but also "le prang formidable."

The construction of the Vn diagram does not require the mystic manipulations of the professional aerodynamicist. All the information needed is right in the handbook. Much can be learned from a study of the diagram—in fact some surprising discoveries sometimes emerge.

In the March 1963 issue of *USCG Flight Safety*, LT Al Reif authored an article, complete with his own Vn diagrams, to show that the turbulence and thunderstorm penetration speed for the HU-16E aircraft had a maximum limit of 124 knots. This speed is also labelled as more encompassing "maneuver speed," and is a valuable reference point in that an aircraft operating below this point cannot produce a damaging positive flight load. Any combination of maneuver and gust cannot create damage due to excess airload when the airplane is below the maneuver speed. To look at it from the reverse angle, it is the minimum speed at which the limit load can be developed aerodynamically.

LCDR Bud Hobdy had already discovered the above information from his own homegrown Vn diagrams, and also found another handbook discrepancy. Maneuver speed will remain constant regardless of aircraft weight, but weight certainly plays a leading role in stalls and overstresses. Stall speeds and limit load factors must vary in accordance with gross weight. Examine the Hobdy Vn diagram below?



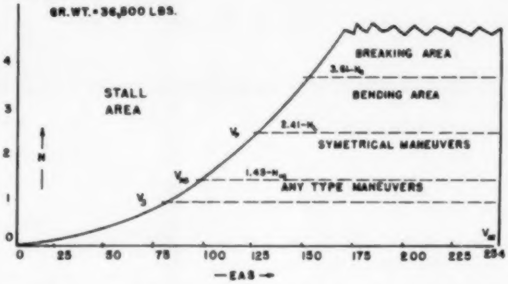
Vs = 75 knots (Unaccelerated, level stall speed)

Vns = 106 knots (Max non-symmetrical wing loading stall speed—above which aircraft can be overstressed before it stalls)

Vp = 124 knots (Maneuver speed—flying at this speed will result in the aircraft stalling before it can be overstressed)

Vne = 254 knots (Never exceed speed. 90% of maximum flight)

As you can see, the maneuver speed comes out right on the button with Reif's figure. It could be no other. Now, each Vn diagram is applicable to only one weight and aircraft configuration. The previous diagram was constructed for the 32,000 lb. clean configuration. Now look at the Hobdy 36,500 lb. diagram and note the significant differences:



Vs	=	80 knots	Vns	=	96 knots
Vp	=	124 knots	Vne	=	254 knots

The unaccelerated level stall speed is greater, which is logical because of the weight increase. The maximum non-symmetrical wing loading stall speed is less, because the wing loading is naturally greater. Maneuver speed does not vary one knot. So what's the big deal? Just look at the non-symmetrical load factors that appear in the two diagrams. At 32,000 lbs. it reads 2.03 g. That's just a skoshy bit over the 2g loading that you will pull with a 60° bank, which the handbook tells us is the limiting angle of bank for the aircraft. But drop down to the second diagram and note the non-symmetrical load factor of 1.45 g. You're long gone with a 60° bank at this weight, because a 45° bank gives 1.41 g loading. At the higher weight, you can just about hack 45° then, but 60°—never. The manual does not tell us this.

So we've learned several undisclosed limitations just by studying the diagrams. Now note that there is no negative in the envelope. Weightless flight, therefore, is okay, but if you bounce off the overhead, you've overstressed the machine. So you can see the Vn diagrams do have important meaning to the professional aviator, regardless of the type of bird he flies. To know your aircraft means knowing all its limitations as well as its capabilities. The Vn diagrams also apply to all pilots as well as all aircraft. Large or small, slight or burly, you possess the ability to overstress aircraft if you are understressed with knowledge. And possibly with distress to friends, relatives and taxpayers.—*USCG Flight Safety Bulletin*

ALL PILOTS READ

Wind-up

It's not often that a snag is so easily cleared as one that was reported as follows: —

"Flight officer's stopwatch unsatisfactory." Engineer's clearance: "Potential energy restored into mainspring by application of turning movement (clockwise) to knurled knob on top of unit at approximately 12 o'clock position."

Leisurely Night Launch

An S-2E was taxied onto the port cat for a night launch. The aircraft had a full fuel load, no ordnance and four persons aboard for a gross weight of 24,300 pounds.

As the catapult fired the pilots felt only slight acceleration and the copilot saw sparks from the bridle proceeding down the deck *ahead* of them. Realizing he had received only a partial cat shot, the pilot reduced power to 45 inches but due to being on instruments he was unable to ascertain how much acceleration he had received from the catapult and he immediately re-applied full power. After approximately 230 feet of deck run the S-2E staggered over the bow. It descended to flight level .001 (ten feet above the water) and was observed to remain at this altitude for approximately one quarter of a mile before commencing a climb.

Worth Repeating

The difference between the notably successful program and one whose record is simply run-of-the-mill is seldom very great. It does not consist of brilliant and inspired flashes of genius—certainly not over a considerable period of time. The difference rather is in the small increment of extra performance diffused over a very large number of individuals at all levels of the organization.—*Adapted from E. I. du Pont de Nemours & Company*

Satisfied?

Do you believe that experience is the best teacher? Accident reports and statistics reveal that some violations have been chargeable to the oldest and most experienced crews. Why?

Complacency is defined as a state of calm satisfaction. Surprisingly enough, complacency is caused by the very things that should prevent accidents . . . factors like experience, training and knowledge contribute to complacency.

As experience accumulates, crews are more likely to become satisfied with their ability to handle any operational circumstance. Actions become easy and automatic. Complacency makes crews skip hurriedly through checklists, fail to monitor instruments closely or to utilize all navigational aids. It can cause a crew to use shortcuts and poor judgment, and to resort to other malpractices that mean the difference between hazardous performance and professional performance.

. . . USAF *"Combat Crew"*

"Picture This"

Date: December 1917

Horizontal Turns

To take a turn a pilot must always remember to sit upright, otherwise he will increase the banking of the aeroplane. He should never lean over.

Crash Precautions

Every pilot should understand the serious consequences of trying to turn with the engine off. It is much safer to crash into a house when going forward than to side-slip or stall machine with engine trouble.

Passenger Safety

Passengers should always use safety belts, as the pilot may start stunting without warning. Never release the belt while in the air, or when nosed down to land.

Engine Noises

Upon the detection of a knock, grind, rattle or squeak, the engine should be at once stopped. Knocking or grinding accompanied by a squeak indicates binding and lack of lubricant.—*"The Hot Mike"*

Altimeter Reading

Recently, while a pilot was resetting his altimeter to field pressure altitude, he noticed the 10,000-foot pointer was halfway between ZERO and ONE (this would be a reading of 5000 feet). However, the thousand-foot pointer was on ZERO and the 100-foot pointer was on 186 feet (field elevation). This is not a case of turning the set knob up 5000 feet but rather indicates an internal malfunction of the 10,000-foot pointer itself (the 10,000-foot pointer can be moved independently). The altimeter was taken to the instrument shop and a vacuum check was made up to 40,000 with the defective altimeter's 10,000 foot pointer maintaining a 5000 foot error the entire time. The altimeter had been installed three flights prior to discovery and had flown 52 hours with no discrepancy noted. Speculation exists that the 10,000-foot pointer stuck between ZERO and ONE on final letdown and landing of the previous flight and remained undetected until preflight.

All crewmembers beware!

In at least one model the 10,000-foot pointer can malfunction independently of the other pointers.—*"Combat Crew"*

VS-30 constructed this rack for aviators' equipment from scrap materials. The rack prevents damage to such items as life vests, parachute harnesses and helmets — equipment sometimes laid on the deck while pilots filled out the yellow sheets. The bottom part is used for items not easily hung up. The wooden pegs prevent tearing of life vests. The rack has castors so that it can be moved about easily.

(Editors note: It might be more desirable to hang the life vest on a wooden coat hanger on the wooden peg.)

An Idle Caution

Should you have to run up your jet engines, make sure there is no combustible material behind the ship, even at a considerable distance. This may be material on the ramp or in an open cargo compartment of another aircraft. When a jet engine is idling, carbon is likely to build up around the spray nozzles. Then, when power is suddenly increased, the light sheet metal components (the combustion can, for example) tend to warp slightly, but enough to crack off the hot carbon particles. These "sparks" can be driven some distance by the power of the jet efflux and, conceivably, could ignite any flammable material they strike.

—FSF Bulletin

Altimeter Fluctuations in Rain

Flight Safety Foundation reports that during a recent investigation initiated by an airline, reports were received of rather large fluctuations in altimeter indications when flying through heavy rain. The reported excursions from the norm were on the order of 75 to 200 feet! If you observe any abnormal altimeter behavior when flying in rain, pass the information to NASC.

Please include the following:

If more than one altimeter is aboard, did they all act the same way; did vertical speed indicators also fluctuate; at what altitude did it occur; how turbulent was it?

Copilot Cross-Check

BEA is emphasizing a most important point in the Flight Handling Section of its Operations Manual—the positive monitoring of flight instruments between Vr and 500 feet:

"Because of the great reliance being placed on flight instruments at this stage of the flight (rotation), a positive monitoring and cross-checking of flight instruments is necessary. To this end, the pilot acting in the capacity of a P2 (second pilot) is instructed to concentrate his attention on flight instruments between Vr and 500 feet, and any apparent indicated abnormality in the expected behaviour of airspeed indicator, artificial horizon or altimeter should immediately be brought to the attention of the Captain."

Cockpit distractions are the possibles behind several "impossible" aircraft accidents. A recent air carrier accident report listed a probable cause as "diversion of the Captain's attention during takeoff which allowed the aircraft to settle to the runway striking the Nos. 2 and 3 propellers."

Cross-checking of flight instruments by the non-flying pilot might well have prevented such accidents or incidents. . . .—*FSF*

Quote and Unquote

The time and energy that go into an accident investigation almost always exceeds the time and energy that could have prevented the accident.

— USCG FSB

Concentration

I was number three in a four-plane division scheduled to practice bombing on the spar in preparation for an all-fleet shoot off of A-4 squadrons. All was going according to schedule when I turned in for my third run, a pop up/lay down delivery. As I commenced my dive down to sea level to pick up 500 knots and meet the complex rules of popping up to 275 feet, I noted a glow in my fire warning light. There were no other indications of fire and my first thought was, maybe it was sunlight or some reflection on the bulb. Because of this I put all my attention on the light, using the press to test feature and not paying any attention to the aircraft altitude.

Suddenly I looked out to see the surface of the water rushing up at me and I snapped the nose of the aircraft up, meanwhile thinking to myself that I'd had it. In fact when the aircraft buffeted from the acceleration of the maneuver I thought I had hit the surface of the water. The number four man saw a "dish" in the water where I had pulled up. As I climbed through about 2000 feet I weakly informed the flight leader and the ship that I had a glowing fire warning light and was checked in flight for signs of fire. The light subsequently went out and I landed aboard without further incident.

The moral of the story is: When you're flying an aircraft don't ever forget it. Don't allow an unexpected happening, break your scan pattern. I am a fairly senior mouse with a 12-1/2 years of flying plus my major's leaves and due to inattention I very nearly "bought the farm." The irony of it all was that I had just given a little pep talk on the old slogan "Flying is not inherently dangerous, etc.", and then I went out and got careless. Oh yes, I downed the aircraft for inspection of overstress *and* for the fire warning light.

A ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in ready-rooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

Rivet Jams Controls

An RF-8A pilot returning to the carrier in westpac was unable to raise the wing for landing because the incidence handle would not move. All attempts at raising the wing were unsuccessful. The aircraft was refueled from an A4 tanker and bingoed to the nearest divert field which was 600 miles away.

The incidence handle would not move because during acrobatic maneuvers the top pin of a huck rivet had become lodged in the wing incidence solenoid gate in such a way that the gate was held in the locked position. Although the probability of a small pin like this finding its way into a vital position seems remote, this incident proves that it can happen. Only good fortune in prompt inflight refueling and a successful long overwater bingo averted a very serious mishap.

This *Anymouse* is submitted in hopes that it will draw attention to the importance of *Good Housekeeping* in all sections of an aircraft.

Look Ma, No Teeth

On or about 0800 the plane captain, while checking bail out bottle during preflight, sneezed and lost his false teeth under the seat.

This again shows the necessity for removing *all* loose gear while around aircraft.

Backpack Fouls Controls

After 14 years flying Navy aircraft and some 9500 flight hours, I almost pranged my first one today because I didn't give my personal attention to one small item on an otherwise outstanding preflight check. In getting current again in the T-34, I got scheduled for a 1.5 hour local solo on a beautiful sunny day. I made a check of previous discrepancies and strolled happily out to the A/C, checked the cockpit switches and controls and then made a thorough walk around.

The line crewman, seeing I was alone, said he would secure the rear cockpit. Normally, I do this myself, but seeing as how it was such a pretty day and the line crewman seemed so eager, I readily agreed and climbed up front.

After 1.5 enjoyable hours which included a couple loops, wingovers, wingover rolls and 3 practice spins I returned for a landing. I made a beautiful pattern until breaking my glide for the flare. The stick wouldn't come back past neutral! I added some power, pulled back a bit harder but still no response. A quick thought hit me about this time, that I was about to buy my first one ingloriously in a T-34 if things didn't get right quick. I began a wave off at 10 feet then felt the stick come back. I cut the power, flared, touched down and headed for the barn. Taxiing back, I racked my brain for the cause of this dilemma, wondering whether the back chute had come loose. It had, during my acrobatics, and slid forward blocking the aft movement on the stick.

Saints Preserve Us

It was All Saints Day and as we approached our destination we heard an S-2 driver being told by the tower that the field should remain VFR until 1330 or so, and as it was then only 0930 it sounded good.

We were using up some of our proficiency time taking some boys being transferred and their sea bags on their way. As GCA turned us off the range station and made a few identifying turns and muttered the usual jargon all seemed normal — that is until about five minutes later when GCA confessed they had never held us on radar.

Along the route we had been hitting each check point fairly well; but we had suddenly been quite late at the destination. (Later we realized we had crossed the front with its wind shift.) GCA called back and said they now held us. Identifying turns, followed by a very peculiar pattern and precision approach was started. What followed was sort of a search radar nothing approach, followed by nothing, which was broken off at 300 feet by the pilot (the weather was about 200 feet and ¼.)

We didn't see him but the S-2 driver saw us (this was in heavy rain and clouds), so he must have been close. The tower operator said there was some confusion as to whether or not the field was VFR (at 200 and ¼), but would we mind landing down wind in 35 knots with gusts. GCA said, "Would you please go back to the OMNI and make a VOR approach." (go away). I got stubborn and said, "No, we will make a GCA."

And then they got themselves squared away and gave us a good approach and even let us circle and land into the wind.

In the operations office, as we walked in, the Operations Officer, GCA Officer, Tower Operator, two GCA Operators were lined up. Apologies were followed by coffee.

We by-passed the field on the way back.

PARACHUTE RELEASES

Dear Headmouse:

I wrote the Naval Aviation Safety Center some months ago for information on parachutes for a research paper. It was received and thank you very much for the material.

Last night two questions passed through my mind:

- Why doesn't the Navy use an all-purpose harness equipped with Capewell or similar quick release devices for the canopy of the chute?
- Why hasn't the Navy developed or used a quick-release device?

MIDSHIPMOUSE

► The Capewell quick-release snap for conventional parachute harness assemblies was introduced in the Navy as early as 1955 and is still in use. Rocket Jet parachute canopy release devices introduced in 1956 are now incorporated on integrated torso harness assemblies. Ejection seat equipped aircraft manufactured after 1956 were designed for integrated harness assemblies. Some aircraft manufactured prior to 1956 have been retrofitted with ejection seats that use the integrated harness system. However, a complete across-the-board change to canopy release devices for conventional harness systems would not be feasible due to the cost involved in modifying parachutes and seats of aircraft being phased out.

The Navy has evaluated four new release devices: The Douglas release, a modified Rocket Jet release, the Kinning release, and the Koch release. All four were designed as possible replacements for the Rocket Jet release now being used. The Koch release was judged to be the best of them. Presently air wings from ComNavAirLant, ComNavAirPac, CGFMFLant, and CGAirFMFPac are evaluating this release.

Very resp'y,

Headmouse

BPH-1 Helmet

Dear Headmouse:

Is there anything to the rumor that two pilots have suffered broken necks because of wearing the BPH-1 helmet? What is the current status of the BPH-1?

ANYMOUSE

► A study was made of all accidents wherein one or more of the occupants were wearing the BPH-1 helmet. Analysis of the 17 accidents involved revealed no injuries caused by the subject helmet or attributable to its being worn. In one accident serious head injuries prevention was specifically attributed to the BPH-1 helmet. Overall it appears from reports that this helmet has prevented, not caused injuries.

The Safety Center was advised by BuWeps that only 2000 BPH-1 helmets were procured as a preliminary solution to the requirement for patrol plane buffet protection. As a result of fleet comments involving comfort, sound attentuation, earphone mounting and webbing attachment adjustment, BuWeps deferred additional procurement. Design modifications are being made to correct the above discrepancies and a quantity for flight evaluation will be procured. On completion of successful flight evaluation at NATC, revised design data will be furnished to the Aviation Supply Office for procurement of helmets. While not carried under normal allowances in Section H, no directive exists which prohibits use of those BPH-1 helmets now in existence.

Very resp'y,

Headmouse

Early Naval Aviators Sought

Washington, D. C.—A comprehensive search is being made for the addresses of early naval aviators and members of their families. The *Naval Aviator Register*, with the cooperation of the Department of the Navy, the Marine Corps and the Coast Guard, plans to include them in a commemorative register now being compiled.

Families of living and deceased early Naval Aviators are urged to contact *Naval Aviator Register*, 2500 Wisconsin Ave., N.W., Washington 7, D. C.

Wants Preoiling Info

Dear Headmouse:

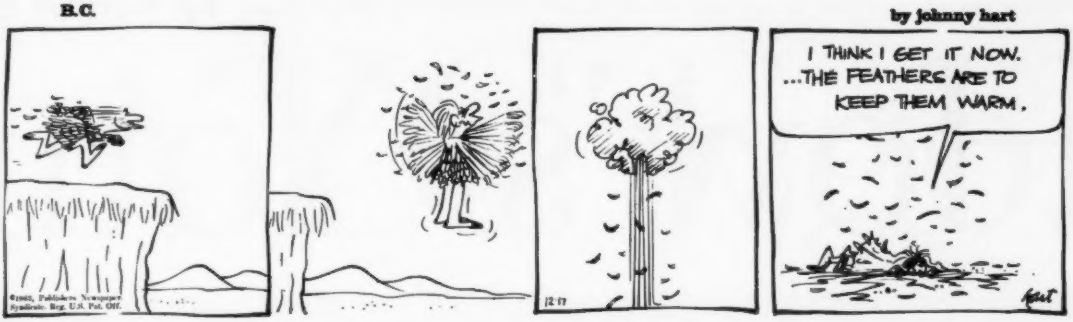
I believe there is a need for a detailed article on the why's of preoiling and exactly how it should be done. ComNavAirLant has publicized the procedure — GREB 216 doesn't say enough.

I know of A-1H squadrons who use the rear sump magnetic plug (pressure side) instead of the preoil fitting. This seems to be easier with the use of an adapter. I don't know how effective it is but they say "this is the way we've always done it in the fleet." I keep hearing how the VP and VW types do it and how carrier or tailhook types have to do things different.

I'm a believer in preoiling and have been for years. Although I singled out the A-1H, I know P-2s, C-121 types as well as the R-1820 boys are pretty much in the same boat. Please publish the straight dope.

ANYMOUSE

► GREB 216 outlines preoiling policy but one must refer to the applicable Handbook of Service Instructions for the par-



ticular engine for how-to details. NavWeps 02A-35JR-2 of 15 Jul '63 covers the R3350; NavWeps 02A-35GN-502 Rev. 1 July '63 the -82s and -88; NavWeps 02A-35GM-502 Rev. 1 Sept. '63 the -84s. In addition, NavAer 15-01-500 Handbook of Preservation of Naval Aircraft for shipment and storage contains preoiling guidelines.

As requested, the why and how of preoiling taken from these publications appear in this issue commencing on page 34.

Differences in practices between A-1H types and others stem from the fact that the preoil plug on the engine is difficult to get to, so mechanics use the pressure side of rear sump plug. While this method seems to get the job done it is not authorized. The reason: engine main oil strainer is bypassed, consequently the risk of contaminating the engine is increased.

Wright R3350 Engine Bulletin 742 now provides a preoil check valve for improved accessibility and to facilitate preoiling — 26 WB/WD, — 32W/WA, — 34, — 42 and 36W/WA engines. Preoil check valve assembly, Manufacturer's Part No/148831, FSN R2810-967-0092-PWAC replaces the present preoil plug and reducer. See illustration page 37.

Very resp'y

Headmouse

Sleep

Dear Headmouse:

I would appreciate any information you have concerning:

- Human reaction time in relation to the amount of sleep an individual has had.
- The physical condition of the human body in relation to the length one can remain at altitude without becoming hypoxic.
- The relation of drugs to the aviator's ability to function at altitude.

ANYMOUSE (PHYSIOLOGY TYPE)

► The records held by this activity regarding the effects of sleep and drugs on the overall physical fitness of an individual are quite limited and refer only to those cases in which these factors were considered causal in aircraft accidents. Although other cases occur, they rarely are reported to the Safety Center.

The *Handbook of Human Engineering Data,* (NavExos P-643) contains a useful summary of sleep as a factor influencing physiological conditions, along with a 17-item bibliography. Requirements, habits, type of work and environment vary so tremendously that a single satisfactory answer to the question, "How many hours sleep does a man need?" is impossible. It is also noted that tests often do not show significant changes in reaction time, and so forth, yet the true loss is not apparent since, during relatively short test periods, individuals are able to compensate for any losses in efficiency.

It is suggested that you contact via the proper chain of command the below listed activities for such detailed information as you desire:

COMMANDING OFFICER
U. S. NAVAL SCHOOL OF
AVIATION MEDICINE, NAS
PENSACOLA, FLORIDA

COMMANDING GENERAL
SCHOOL OF AEROSPACE
MEDICINE
USAF
BROOKS AFB, TEXAS

Very resp'y

Headmouse

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

Dedicated tongue in cheek to our many friends with ulcers and controllers tickets. **By Helmut Els r**

How's You

Have you ever had that sort of inferiority complex: sitting in your position with just two or three aircraft on your frequency and nothing to tell them, the suspicion crawling in your stomach that the pilots might think they'd be able to fly on their own, without your assistance. . . .? Well, if so, here are some advisories which may offer a remedy for you.

First of all, don't ever respond to a pilot's "good morning" or "good evening." If you do, he will think you have time for such trivia and besides, it creates the impression that you are just another ordinary human being. Simply shoot your first instructions at the pilot as rapidly as you can, to make sure he won't get it the first time. He must realize that you are busy and it is a lucky coincidence that you can talk to him at all. Give short, abrupt transmissions, putting strength into your voice to show him who's the boss. Tell aircraft No. 1 the runway-in-use, then aircraft No. 2 the altimeter setting, aircraft No. 3 to turn right, heading 130. Then tell aircraft No. 1 the altimeter, No. 2 the runway, No. 3 to turn left, heading 110, then start again with aircraft No. 1. Soon you will have them all believing your area is packed with traffic, and in addition, you can prove their stupidity by shouting:. . . . . "that transmission was not for YOUUUUUUUUHHH!" Pronouncing the last word that way, the unspoken "stupid!" is burned into the pilot's brain, making him blush over his inferiority.

Keep a cigarette in your mouth while speaking, so pilots can recognize by your enunciation how busy you are with your hands. Two cigarettes at

ATC Ego?

a time plus chewing gum are even better. There are reasonable chances you may double the amount of your transmission.

Don't be afraid of hollering now and then. This intimidates many a striped flyer. The other pilots on the frequency consequently will fearfully keep their transmissions to a minimum, which in turn gives you more time to. . . . . . .

Have your coordinator shout strange-sounding phrases while transmitting, like: "Take four over QT!" or "jet cute hot!" or "23 skidoo!" Anything goes, as long as it's loud enough to go out on the air.

Do not answer the first or second call of a pilot. Instead, hold your breath for 30 seconds, then, after the third call step in real rapidly and burst out: "Sorry — gasp — I was busy — yech — on another channel—gasp—say again." This trick makes the pilot imagine you as the button-pushing, flip-switching, multi-channel superman, even when working on a one-frequency position. Before you release an aircraft to the tower, don't forget to have the pilot call you via telephone after landing. (You'll always find something to argue about.) This procedure will make him continue the flight to a landing with shaky hands, and on the telephone you once more have an opportunity to represent the monstrous, gigantic, omniscient, super-manned Air Traffic Control System to the miserable creature on the other end of the line.

P. S. By the way, there are some pilots who have respect for the air traffic controller nevertheless.

Journal of Air Traffic Control

NO SWEAT

By LT C. R. Mandly

It was a pleasant spring afternoon on board one of those luxury liners most aviators affectionately refer to as "the boat." The ship was steaming in an area just off Monterey Bay during a carqual operation. A few puffy white clouds were sprinkled on the horizon, the deck was steady and it was truly an ideal day for carrier operations.

A young Navy lieutenant manned his plane on the flight deck just behind the island. He was a second tour fighter pilot with 1200 hours of jet time and 1500 total hours. Carrier aviation was nothing new to this lad, although bringing the F-8 aboard seemed to demand a little more skill than had the old *Cougar*.

Once tensioned up on the cat, the power was added to full bore. As the steam cat accelerated our tiger into the blue, he thought what a great day to be alive.

He turned downwind, dropped the hook and slowed the aircraft to approach speed. The turn off of the 180 brought a slight increase in power. Just off the 90, the pilot could see the meatball appear in the mirror. Rolling out on final, the ball was just a tad high so he squeezed off a couple of percent. As the plane passed over the ramp and touched down, the ball was observed to pass out the upper left hand corner of the mirror. The throttle was two-blocked, but that anticipated arresting tug was not realized. The LSO's voice broke through the headset, "Slightly high, hook skip on five."

For some reason the U-bird was not climbing as it should. A quick check of the tach indicated only 85 percent, although the throttle was all the way forward. After one or two more futile attempts to regulate the power setting, he told pri-fly of his apparent throttle linkage failure. Pri-fly was quick to respond with a steer to the bingo field, his duty station.

Ten miles south of the field he called for a landing on 32 right. The tower asked if he would like to declare an emergency, have the mid-field arresting gear rigged, or any other assistance. The pilot assured the tower that there was *no problem*. As soon as he got to 1000 pounds he would make a final approach.

Really no sweat, what could go wrong? If this had been something hairy, he had ample fuel to go down to Edwards and play X-15 on their dry lake. Since the problem was *so minor*, it only seemed logical to land at home base where you had your own maintenance personnel to assist you.

After a few passes at the field, the aircraft seemed controllable with the use of speed brakes. The indicated airspeed averaged 160 to 170 knots, but stopping would be no problem on this runway after securing the engine. Besides, there is always that tailhook and anchor chain combination for deceleration.

The fuel gage indicated 1000 pounds. "This was it," the pilot thought as he came through the 90. "Better make it a good pass. This is where you need it." He came over the fence at 170 knots, crossed the end of the runway and secured the emergency fuel valve. He flew it down to the deck, anticipating the engine stopping at any second.

Sure is amazing how rapidly that U-bird seemed to eat up the runway at 170 knots. No sweat, he still had 5000 feet to the end of the runway and 3000 feet to the arresting gear.

The pilot decided to drop the hook. From the noticable nose down attitude to hold the aircraft on the deck, he rotated the nose up crossing the arresting cables to assure hook engagement. The rotation got the bird airborne. He missed the arresting gear. One thousand feet to the end of the runway and the engine was still going. Perhaps the shut off valve hadn't worked. The pilot pulled in the brakes and got airborne. Approximately 50 feet in the air the engine stopped. So did the pilot.

"THIS IS AN EMERGENCY" is something that most aviators find very difficult to say. Perhaps it is because this phrase has been used by a few Frantic Freddies to return early from the night noises. Perhaps we just don't want anyone to think that we're not calm, cool, and collected at all times. It's the same old story; we want a practice DF steer rather than that other kind. People cannot help unless they know your problems. Next time you are tempted to say "No sweat," reconsider those famous last words.

Arrested Development

There is no Navy-wide standard for night lighting of field arresting gear.

There must be *some* need for identifying the arresting gear at night because different air stations have designed different lighting arrangements, red arrows, "A" frames, etc.

Is it a luxury, or a necessity?

Let's ride through a night emergency landing with a pilot of an A-4C and see his problem.

The aircraft had a malfunctioning landing gear; the pilot was bingoed and told to make a wheels-up landing ashore. Upon notification of the inbound cripple the air station laid a foam strip in the vicinity of the midfield arresting gear. Weather was 1300 feet overcast with about 4-5 miles visibility.

During the approach to the field the pilot asked for a truck to be parked perpendicular to the runway at the arresting gear with the truck light shining across the runway. There was no request for an LSO and none was on station when the aircraft broke out below the overcast. A low fuel state prevented a familiarization pass over the runway but the pilot was told the arresting gear was located halfway down the runway and lighted by truck headlights.

GCA was bringing the airplane in on a normal approach so upon reaching the vicinity of the threshold the pilot leveled off at about 20 feet. He had made the approach with speedbrakes in and was slightly fast at this point. The lighting of the arresting gear was indefinite and confusing with the red rotating lights of the truck the most visible. However, crash equipment was in the vicinity of the runway, also with flashing red lights, and that added to the pilot's confusion.

He continued down the runway at low altitude, slowing to approximately 125 knots. With no outside assistance to aid him in determining the proper touchdown point, he came back to idle and the airplane touched down 2000 feet short of the arresting gear (and also short of the foam).

The aircraft slid straight up the runway and at an estimated 20-30 knots the aerial refueling probe picked up the arresting wire. The wire rode up the probe and cut into the radome, bringing the aircraft to a stop. Prior to the engagement the starboard drop tank had collapsed allowing the nose to drop lower than normal on this type landing.

Damage was minor and the pilot was able to fly the aircraft back to the ship the following afternoon.

You may not always be able to provide a runway portable, LSO, or even foam for the pilot of a disabled aircraft. And if the A-gear has to have temporary illumination by headlights remember that one set of flashing red lights near the runway is a better target than a whole batch of flashing red lights.

Standardized arresting gear marker now under study may soon replace local markers such as this early one at Miramar.

through the cactus

The ejection was very smooth – no kick in the pants. The wind hit the face curtain – then I was on my back with the curtain lying on my chest. There was no sensation of falling – it was very comfortable in this position.

After some time I let loose of the face curtain, grasped the ripcord with my right hand and folded my left arm over my chest. To avoid tumbling or any gyration I remained in this

position for the rest of the free fall. Glancing down to the left to see how close the ground was, I saw the tailless aircraft in a flat spin, on fire and directly under me. I was falling faster than the aircraft and was in danger of hitting it. Just as I made up my mind I was getting too close and was going to pull the ripcord, the chute deployed.

During the free fall my hard hat, gloves and oxygen mask stayed with me. No difficulty in breathing was encountered. The bailout bottle was supplying oxygen as advertised although I hadn't activated it. The mask seemed to be about an inch from my face during the free fall. The air wasn't cold, and the free fall was the most comfortable part of the descent.

The chute opening was a real head shaker. I oscillated back and forth as if in a swing but since it was not uncomfortable, no attempt was made to stop it. I realized that I was traveling over the ground quite rapidly. I turned around in the chute to face my direction of travel — only to see the mountains and, to my horror, a cliff. Was there anything in my training covering the art of landing against a cliff? Fortunately this terrifying prospect disappeared as my lateral movement increased. My touchdown point now appeared to be some rocks on the canyon floor. With the high wind, dragging would definitely be a problem. Again I turned around in the chute so that my back was to the direction of travel and my hard hat would bear the brunt of the blow on the rocks; bent my knees slightly, put my feet together and hoped for the best.

After contact with the ground, I found myself being flipped over and pulled through the cactus on my stomach at a speed of 10 to 15 miles per hour. After a short time, I managed to release the right rocket jet fastener by relieving tension on the right riser. Tried several times but could not release the left fastener, so I gave up and attempted to spill the air from the chute by pulling on the left riser — but at the speed we were going it was useless. Then I tried grabbing anything to slow down this ride through the cactus.

As the bottom edge of the chute was three or four feet off the deck, I had good forward vision and saw a small cactus tree that the chute would hit. Hoped fervently it would slow the chute momentarily and relieve the tension long enough to release the left rocket jet fastener. When the chute hit the tree, I was ready. The chute continued on for another 10 to 15 feet and caught in some more cactus trees. From touchdown until release from the chute was approximately 200 feet.

After catching my breath, I realized that my hard hat and gloves were gone. Retracing my very discernible path through the cactus, I found my hard hat at the point of impact with the ground in the rocks. The oxygen mask had been pulled through its holder and the holder was attached to the APH-5 helmet on only one side — evidently my chin strap wasn't tight enough. Found one glove about a third of the distance from the point of landing and my wrist watch near the end of the ride.

After a few minutes an A-1 and a Coast Guard UF were circling over me and I could also hear my playmate circling overhead. In preparation for the helicopter arrival, I got the two smoke flares out of the life preserver. I ignited one when the helo came into view but it was heading in the wrong direction — fired the second when he was making his approach in order to assist him in ascertaining wind direction and velocity. He landed alongside me, and I boarded for the trip to the air station. I was on the deck only a half-hour.

Subsequent testing showed the rocket jet fasteners to be within *normal limits*. The investigating flight surgeon states that in his opinion it seems apparent that increased tension and/or asymmetrical loading on the fasteners makes their release difficult to impossible. If this pilot had landed anywhere else in a one mile radius, the flight surgeon states, this dragging would have probably resulted in more serious injury or death. As it was, his injuries were a sprained left ankle, minor cuts of the scalp, scrapes and bruises of the knees and left shoulder, bruises of the legs, a cut left elbow, and hundreds of small cactus needles imbedded in his skin.

Hypoxia Again

This high altitude flight in the F-4B was the pilot's first and last in the full pressure suit.

The pilot and RIO were strapped into the aircraft and the oxygen system functional checks were completed satisfactorily. The pilot was unable to reach the oxygen regulator on/off switch on the helmet on completion of the check. The parachute rigger assisting him turned off the oxygen regulator so the pilot could raise his face plate and tell him the difficulty. The rigger then adjusted the pressure suit to allow the pilot freedom enough to reach over his head. The rigger did not turn the regulator back on and no one recalls seeing the pilot turn it ON.

Starting engines and taxiing to the high power turn up area were uneventful. Whether or not the pilot had his clear visor down at this time is unknown.

While holding short of the runway for takeoff, the pilot asked the RIO if it was normal to be able to lift the clear visor with oxygen on. The RIO told him to check his helmet oxygen control, upper block, and exhaust hose for proper security. The pilot reported his helmet oxygen on but that the upper block was not completely seated. He then reported putting the block all the way in and that his visor was sealed and he was receiving oxygen.

A high performance, unhooded, simulated instrument departure was made at 1408. The instrument departure was cancelled 1½ minutes later at 17,000 feet and frequency shifted for FAAWTC control.

The flight continued in high performance climb and at 30,000 feet the pilot dumped cabin pressurization to check his pressure suit. Passing 35,000 feet the RIO indicated that his own suit was operating properly and the pilot responded that his was also. (The RIO's headpiece had tested out the previous month with no discrepancies in the oxygen regulator and exhuast valve.)

At 41,000 feet the RIO told the pilot to repressurize the cabin. The pilot made an incoherent response but did not reset the pressurization dump valve. The aircraft went into what appeared to be uncontrolled flight and after repeated calls to the pilot with no response, the RIO broadcast a "Mayday" giving position and call and then ejected. Time was 1415. . . . The RIO was rescued by helicopter.

The aircraft accident investigation board singled out hypoxia as the most probable cause of the accident. "It could not be determined the extent to which the pilot may have contributed to this accident either by taking a wrong course of action or by inaction. It is known that he was not familiar with the pressure suit as indicated by his questions to his RIO concerning his ability to move the face plate with oxygen turned on. His proficiency in the Mk IV full pressure suit is in doubt due to the length of time between indoctrination and his first flight in the suit." (He had received full pressure suit indoctrination and related low pressure chamber run some *five* months before.) "This situation was complicated further by limited experience in the F4 and the demands of a high performance departure for which he was briefed."

Among the board's recommendations were "that full pressure suits be worn on at least one normal syllabus flight, such as instruments, weapons, etc. prior to actual high altitude tactics flight above 50,000 feet. It is further recommended that such flights be conducted within 30 days of pressure suit indoctrination and that a minimum of one pressure suit flight be conducted every 60 days."

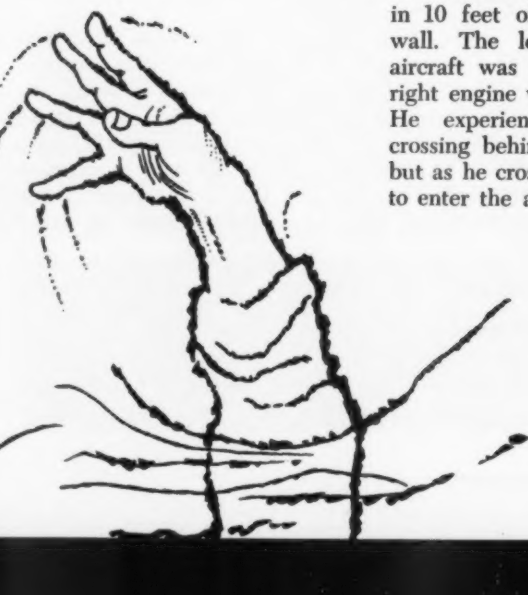
Did You Know?

The word Mayday stems from the French word "m'aidez" meaning "Help me!" It was adopted as a distress call or signal for ships and aircraft by International Radio Regulations because it is brief, clear and unmistakable, and can be pronounced in most languages.

Non-Swimmer

THE only fatality in an A-3B bailout was a crewman who was a non-swimmer with a morbid fear of the water. He did not carefully preflight his life vest; both signal flares were missing and, in addition, the CO_2 cylinder container cap on one side was loose. When he pulled the life vest toggle, the CO_2 on that side escaped. The other chamber, though inflated, did not provide enough buoyancy alone to keep his head out of the water. He failed to top off the vest orally. Rescue personnel found he had not released his parachute.

Close friends later stated that the victim had had an uncontrollable fear of the water and tended to panic when exposed to deep water when swimming. He had never passed his swimming qualifications during survival training and had been sent to the squadron with an *incomplete* in the swimming category.



The flight surgeon recommends that any man who has not passed the swimming qualifications in survival training should be frozen (disqualified) at this point until he can fulfill the requirements or be found disqualified for lack of swimming ability.

Blown off Wall

WHILE checking aircraft for tool boxes, a metalsmith walked behind an EP-2E which was turning up on the sea wall turn-up area. He approached the aircraft from the left side aft within 10 feet of the edge of the wall. The left engine of the aircraft was at idle RPM, the right engine was at 2500 RPM. He experienced no difficulty crossing behind the left engine but as he crossed under the tail to enter the aft escape hatch to get a tool box, he was struck by the propeller wash from the starboard engine. He was blown off the sea wall to the sand below, a 5 to 10-foot drop, and sustained serious injury.

Human factors contributed to this accident situation.

- The fire watch left his position as an outside observer and entered the aircraft after the engines had been started. This left no one to ensure that the area aft of the aircraft remained clear during turn-up.
- The senior plane captain failed to ensure that the fire watch was aware of his dual duties of fire watch and observer for the high power turn up. He continued the turn-up without an observer in sight and no one to warn him if the area aft of the aircraft did not remain clear.
- Line supervision on the sea wall ramp area at the time of the accident was inadequate. Supervisory personnel were not present at the sea wall turn-up area when the accident occurred.

Nevertheless, the *basic* cause of the accident was that the metalsmith, an experienced man, aware of the hazards of prop wash, took a chance so that he could get his job done as quickly as possible.

Bird Strike/Visor Down

IT'S a good idea to fly with your helmet visor down, particularly on low level navigation hops.

A student pilot was flying at 500 feet actual altitude, 330 knots on a low level navigation hop in a TF-9J with an instructor

flying chase. The student saw a bird too late for evasive action. The chase pilot saw two birds, then a black puff as the birds hit the student's windshield. The student, instructed to slow down and climb to 2500 feet, was vectored back to the naval air station. He experienced difficulty hearing because of excessive cockpit noise resulting from the broken panel in the windshield but made a successful straight-in approach and landing.

The student was flying with his visor down at the time of the accident.

Even though only temporary, loss of vision from flying plexiglass, bird remains and windblast can prove fatal on a high speed, low altitude flight.

Knives

THREE civilians who witnessed the crash of an AF-1E rushed to the site and began trying to get the pilot out of the cockpit. Initial attempts to remove the closed canopy were unsuccessful. Although the pilot actuated the emergency canopy release handle, *the canopy did not open because there was no cartridge in the canopy remover.* The rescuers pulled up on the manual canopy removal handle, instead of pulling it back toward the empennage.

By now the aircraft was burning in the aft section. One of the rescuers used a Boy Scout knife to shatter the canopy plexiglass from the outside. The pilot used his survival knife on the inside. The rescuers then enlarged the hole by pulling out the edges of the plexiglass and the pilot was pulled out to safety.

notes from your FLIGHT SURGEON

Sweet Odor

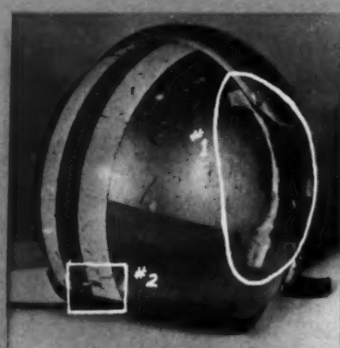
IN an F-4 after 30 minutes on oxygen at a cabin altitude of 13,000 feet, both pilot and RIO noted an unusual sweet odor in the oxygen. Both men became dizzy in less than 10 more breaths. The pilot lost all external visual cues but retained ability to see the cockpit instruments. Oxygen masks were removed and descent made to low altitude. Their dizziness and impaired vision cleared up slowly. The pilot is highly experienced, the RIO is in training.

Chemical analyses were conducted on the oxygen converter, the LOX cart, and the station reservoir. Contaminants present were well below maximum allowable limits. A check of regulators was inconclusive.

The reporting squadron recommends to all air crews that whenever unusual odors become apparent, they secure the aircraft oxygen supply, activate the emergency oxygen supply and land as soon as possible.

Concussion

Flight Surgeon in MOR: "We are fairly certain that this pilot's APH-5 helmet was lost just before or during the ejection since it was found with the remains of the canopy several hundred yards from where the pilot himself landed. He admits that he always wears his chin strap loose and his oxygen mask tight 'because it is more comfortable.' Photos taken show where his helmet hit inside the cockpit and the damage to the helmet. *If the helmet had been worn properly, this pilot probably would not have gotten a brain concussion.*"



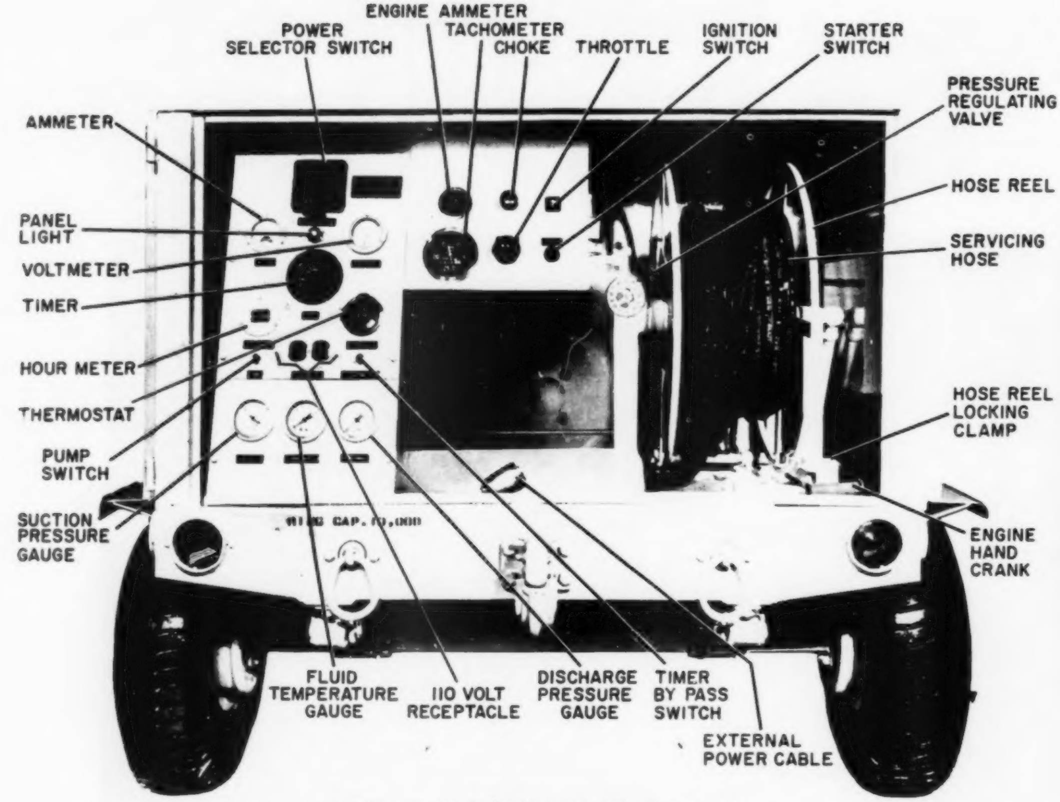
There seems to be some confusion among recip operators as to the why's and how's of engine preoiling — see Headmouse on page 23 of this issue. Herewith is a roundup of the straight dope on:

PREOILING

BuWeps General Reciprocating Engine Bulletin (GREB) 216 states experience has proven that failure to preoil has resulted in failure and premature removal of many engines. Therefore all reciprocating engines, except wet sump types will be preoiled immediately prior to turn-up after initial installation, prior to turn-up after preservation for storage in aircraft, and immediately prior to turn-up any time the engine has been idle for a period in excess of 72 hours.

While general instructions are contained in NavWeps 15-01-500, NavWeps 15-02-500 and BuWeps Inst. 4750.1 which deal with the preservation of aircraft and engines, specific instructions for a particular engine model are contained in the applicable handbook of service instructions. These instructions are to be followed explicitly *except* where superseded or amended by BuWeps or Major Command directives.

Although BuWeps Inst. 4750.1 of August 1962 states that "If the period of idleness does not exceed 14 days, reciprocating engines shall either be run up once every 4 days or have the propeller rotated with the starter at least 4 revolutions



Preoiler type MA-2, Stock No. RD4930-877-0224-S131

every other day followed by run-up once a week, GREB 216 of 26 Nov 1962 states this will not be interpreted as authority to waive the following requirement for preoiling. When an engine is *expected* to be idle in excess of 72 hours, the engine may be turned up at 48-hour intervals as an alternative to preoiling after the 72-hour interval has expired. In this event the engine will be operated sufficiently to bring oil temperature up to the normal range for at least a 5-minute period.

Approved Method

Preoiling by the pressure method, using external source of preheated oil is the only approved method. Therefore one should use a preoiler such as Type MA-2, FSN RD 4930-877-0224-S131 or equivalent. Furthermore, this equipment must be maintained in good condition. The preoiler should be connected to the opening on the high pressure side of the main pressure oil pump which is upstream of the oil strainer.

Preoiling by use of the oil in the aircraft's system and turning the engine through with the starter is not an effective nor approved method and will not be used *except* in instances where the aircraft may be operating from a base where preoiling equipment would not be expected to be available or cannot be obtained.

NavAer 15-01-500 states that whenever possible, engines coming out of preservation or storage shall be preoiled by the exterior pressure method, using a preoiling unit. When such a preoiling unit is not available preoiling will be accomplished by:

a. Filling the aircraft tank or tanks with operating lubricant.

b. Removing a sparkplug from each cylinder and turn the engine through at least 3 complete revolutions by hand.

c. Prior to installing depreservation valves and sparkplugs, prime the oil pump and circulate oil through the engine by motoring the starter until

oil flows from the sump plugs and oil pressure is recorded on the engine oil pressure gage. Do not exceed starter restrictions during motoring.

Preoiling the R3350

Filling the engine oil passages with oil under pressure from an external source while rotating the crankshaft is termed preoiling. This procedure ensures satisfactory lubrication at an initial start when the engine oil system cannot supply adequate pressure. Use preservation depreservation unit, Stock No. R3540-652-4558-S131 for engine preoiling.

Note: After an oil change or any other operation which would permit air to enter the oil inlet line from the supply tank to the pressure pump, it is only necessary to evacuate air from the oil inlet line and oil pump. Open the preoil vent valve on the rear oil pump housing until oil, free of air, is expelled from this port. Close the valve.

Caution: Failure to bleed this air from the oil inlet line can result in an air lock in the inlet line with resultant lack of oil pressure.

Procedure: a. Fill the engine oil supply tank to a safe operating level with engine lubricating oil.

b. Remove the chip detector plugs from the front and rear sumps.

Note: Do not remove the pressure pump drain plug. Removal of this plug located under the pressure strainer will allow the oil from the engine oil tank to drain off if provisions have not been made for a shut-off valve on the oil line.

c. Remove one sparkplug from each cylinder; spark plug removal from cylinders above the horizontal center line is optional.

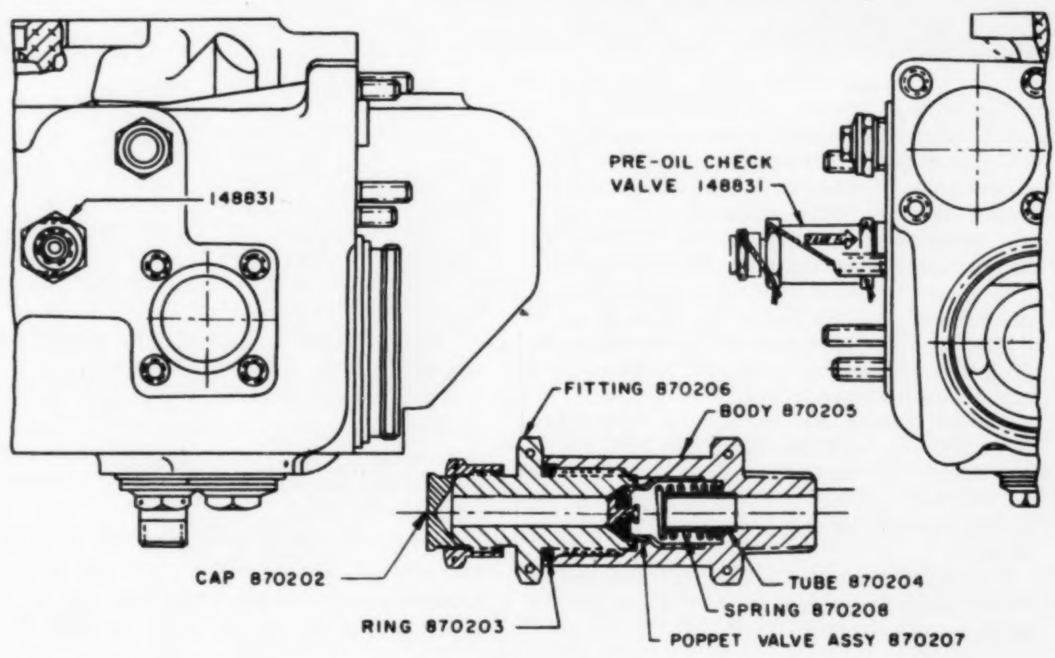
d. Remove the rocker box covers and gaskets from cylinders No. 1 and 2 and loosen the torquemeter connector sufficiently to observe an oil flow at this location.

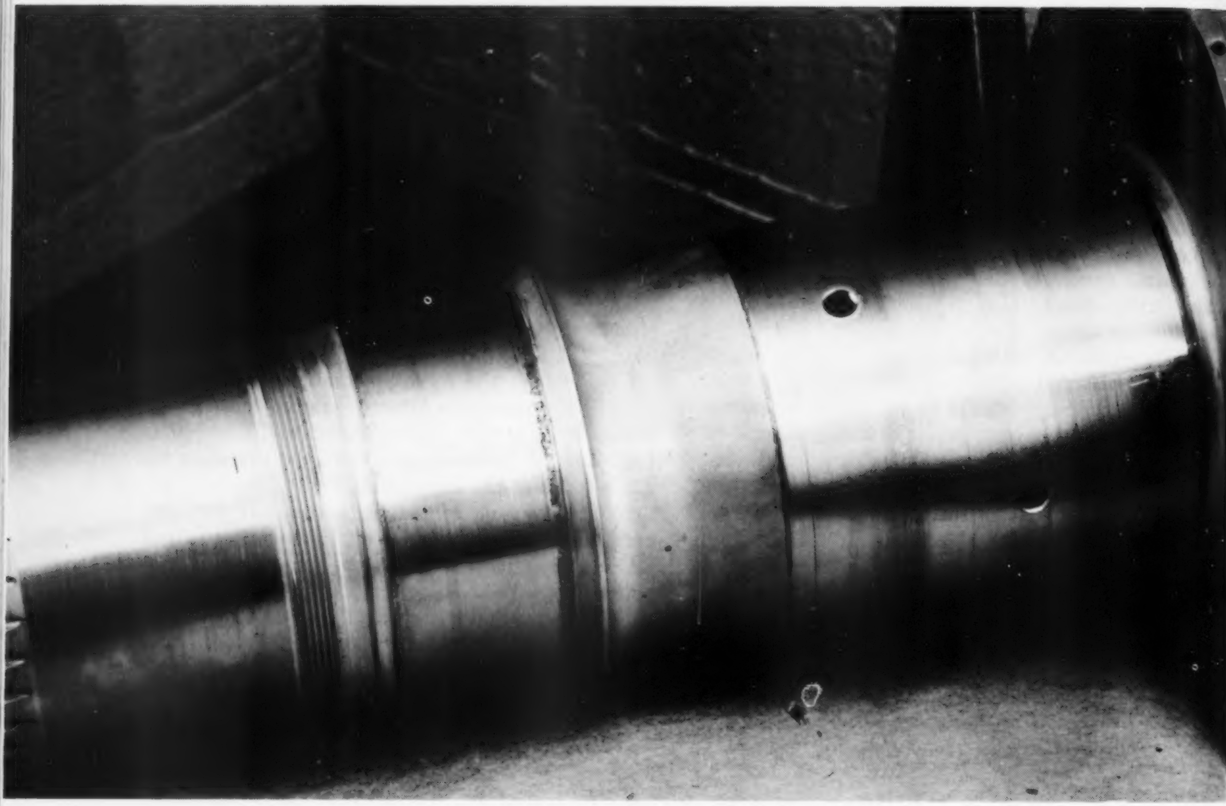
e. Connect the preoiling supply line to the preoiling connection. Pump engine lubricating oil, at 30-50 psi pressure, heated to 73 – 140°C (160-220°F), in the engine from the preoiling rig while rotating the crankshaft.

Note: The engine is not adequately preoiled until all passages permit a free flow of pressurized oil. *An alternate method of preoiling is not authorized.*

f. Continue preoiling until a continuous flow is attained at the rocker boxes of cylinders No. 1

NEW PREOIL CHECK VALVES replace preoil plugs on R3350-26 WB/WD,-32W/WA,-34,-42 and 36W/WA engines to improve accessibility and facilitate preoiling. FSN R4730-541-2780-G250. Ref: Wright EB 742.





Scoring of R3350 propeller shaft resulted from oil starvation. Note areas adjoining oil holes.

and 2 and the torquemeter connector. Install new dry gaskets on the rocker boxes, install the rocker box covers and tighten the torquemeter connector as soon as an oil flow is observed.

g. Disconnect the preoiling line and replace the preoiling connection plug, and drain plugs.

h. Open the preoil vent valve on the rear oil pump housing and allow a free flow of oil to drain. This will ensure that no air remains in the oil in line. Close the valve and lockwire in a tightening direction.

Caution: Ensure that the valve is fully closed following each air-bleed operation.

i. Install the remaining spark plugs in each cylinder and connect ignition leads. Runup the engine immediately after preoiling is accomplished.

Caution: Drain oil from the front and rear oil sumps must be reused in the engine or for preoiling other engines.

Preoiling the R1820

Accomplish preoil under the following conditions:

a. Prior to starting new or newly overhauled engine for the first time.

b. Prior to starting an engine which has been treated for storage.

c. Prior to starting an engine which has been standing idle for more than 72 hours.

If the oil inlet line, oil pump or any other part of the engine oil supply configuration is replaced or tampered with in any way that would permit oil to drain and air to enter the system, accomplish the following:

Remove the preoil plug from the left side of the rear oil pump housing. With ignition OFF crank the engine until a minimum of one pint of air-free oil is expelled from the port. In the

event oil flow is not obtained at the preoil location the engine shall be preoiled.

Procedure:

a. Fill oil tank to safe level with Mil-L-22851 oil.

b. Remove one spark plug from each cylinder.

c. Remove chip detector drain plug from the front sump and supercharger rear housing.

d. Remove, clean and replace main oil strainer on new or newly overhauled engines.

e. If experience indicates delay in obtaining oil pressure response, bleed and fill the oil pressure line between engine and pressure gage or transmitter with oil. Use grade 1010 oil in line during cold weather.

f. Remove inlet check valve and spring and reinstall cover. (Does not apply to -84 engines with Engine Bulletin 578 incorporated.)

g. Connect preoiler to engine preoil fitting on engine oil pump housing. In case of -84 engine also attach an additional line to preoil fitting located downstream from aircraft swing-check valve. Start preoiler and pump until 2 to 3 gallons of oil drains from engine sump and pressure indication is obtained in cockpit.

R1820 piston failure precipitated by oil starvation.

h. Stop preoiler and disconnect preoiler hose from fitting on oil pump housing.

i. Crank the engine with starter 30 seconds maximum until air-free oil (minimum 1 pint) is expelled from the preoil fitting on the pump housing.

j. Reconnect preoiler to fitting on pump housing and restart preoiler. Watch for oil pressure indication in cockpit. When pressure is noted crank engine with starter until 4 additional gallons of oil is pumped through engine and drains from sump.

k. Disconnect preoiler line(s) from engine pump, also from oil inlet line in case of -84 engine. Cap fittings as soon as possible to prevent air from entering. Reinstall inlet check valve spring and cap retainer.

l. Permit residual oil to drain from sump and supercharger housing. Reinstall. magnetic plugs and spark plugs.

m. Start the engine in accordance with approved starting procedures as soon as possible following preoiling. Insure all depreservation precautions are observed in case of new or newly overhauled engines.

n. Preoil prop domes as applicable by feather/unfeather cycle prior to engine turnup whenever the prop dome is removed or drained.

Whenever an oil strainer is removed for cleaning or inspection during conditions not normally requiring preoiling, observe the following precautions:

a. Remove strainer assembly and immediately replace with clean assembly while engine oil inlet temperature is at least 40°C or higher.

b. Before oil temperature drops below 40°C turn engine through with starter, ignition OFF, until oil pressure indication is noted in cockpit. If oil pressure is not indicated in 30 seconds, allow starter to cool.

c. Each preoiling shall be logged in the engine logbook giving date and reason for preoil.

Log Entries

In order to insure a complete, pertinent engine maintenance record, each instance of preoiling, or authorized ground turn-up in lieu of preoiling must be recorded in the engine log and authenticated by signature and activity. This entry is waived when preoiling is accomplished during periodic inspection if the requirement appears as an item on the inspection form.

The Key to Lox

By T. W. Smith, AMSC
NAMTRADET 1072
NAS Sanford, Florida

MUGS has been busy again! The other day on the station flight line I observed a man preparing to service a Liquid Oxygen (LOX) System. Instead of the recommended safety clothing for this operation, this man wore only a face shield. Rags, wrapped around the oxygen delivery hose had been substituted for the required gloves he should have been wearing. This apparent disregard for the safety rules as set forth in the Manual for Field Handling of Liquid Oxygen (NavAer 06-30-501) was not only shocking, but it was an outstanding example of why these instructions were promulgated.

I questioned the man and asked him his rating. He was an Airman Apprentice. Questioning further, I asked, "Have you had any AME schooling or safety courses in handling LOX?" His reply was negative.

Having men with little or no technical training assigned to a technical job is a fairly common occurrence. The only way that these incidents can be brought under control is for *all* maintenance personnel to have a complete working knowledge of the necessary safety rules and safety factors involved in a specific task. Further, it is the responsibility of the higher rated personnel to ensure that these safety practices and rules are followed to the letter.

Precautions for Handling LOX

LOX in inexperienced or unfamiliar hands can be very dangerous. Conversely, it can be handled by trained personnel, using proper equipment, with a minimum of danger. The possible dangers of LOX can be categorized into three general characteristics.

First, the rate of combustion of any flammable substance is greatly increased in the presence of pure oxygen. Substances which would not normally be ignited in the normal course of aircraft maintenance are highly potential fire hazards.

Second, LOX is very cold. Contact with LOX, at minus 297°F, can result in a severe case of frostbite for personnel and can damage valuable equipment which is vulnerable to freezing conditions.

Third, the high expansion ratio of LOX. Liquid oxygen if confined, will evaporate as its temperature rises, and will build up tremendous pressures which are capable of rupturing the storage container.

In view of the foregoing possibilities, the following rules should be widely publicized and strictly adhered to:

Personnel should have adequate knowledge of the properties and dangers of LOX prior to handling it.

- Ensure that all fittings are corrosion free.
- Place protective covers over equipment which may be exposed to overflow.
- Aircraft must be serviced in an oil and grease-free area. Do not fuel or replenish oil while LOX servicing is in progress.
- Ensure that all electrical power is OFF.
- Ensure that the overboard vent line, drip pans, access door, and immediate surrounding area are grease and oil free prior to servicing.
- Protective clothing such as face shields, gloves, shoes and aprons should be worn. (It is recom-

mended that large, quickly removable, heavy-weight rubber gloves with loose fitting canvas glove, inner-liners be worn to prevent liquid oxygen from contacting bare skin.)

Beware Greasy Kid Stuff

• Clothing of tightly woven material should be worn, so that oxygen cannot accummulate in the interstices. In addition, greasy hair preparations and other grease base cosmetics may prove dangerous.

• If LOX contacts the bare skin, wash the affected area of skin immediately with cool, clear water, then report to nearest first aid station immediately for treatment.

• If LOX is spilled or splashed on clothing, get out of clothing as quickly as possible. Normally, clothing material will become saturated very quickly.

• Do not handle tubing or fittings with bare hands while liquid oxygen is flowing through the lines.

• Liquid oxygen must be handled with care, similar to a combustible material. LOX will not burn, but it increases the flammability of any combustible material. It is possible for LOX to accumulate in pockets and present a fire hazard for some time in an isolated area.

• The standard "No Smoking Within 50 Feet" rules common to aircraft and servicing operations apply to LOX as well as to other steps in aircraft servicing and maintenance. The area where LOX is handled or stored must be well ventilated for safe operation.

• Because of the extremely low temperature of liquid oxygen, care must be taken that it does not come into contact with the skin. A slight contact will react similar to a flash burn. If such a burn should occur, the same treatment as for frostbite should be observed.

Safety indoctrination programs should be in operation at all activities where LOX is used. The Naval Air Maintenance Training Group Detachments, located at most major Naval and Marine Corps Air Stations can provide assistance and training for operators in conjunction with the weapons systems courses conducted on specific aircraft. The danger is present, the problem exists, and the solution is at hand. From the standpoint of safety, there is no reason why LOX or LOX equipment should be handled by unqualified personnel. Increase personnel safety — utilize Naval Air Maintenance Training.

Allowable Hydraulic Leakage

We have received a lot of questions lately about how much leakage is allowable for this or that hydraulic component. Back in 1957 we printed an article on specification requirements regarding leakage; standards haven't changed since then, so we'll go over it again to refresh everyone's mind.

Mil-C-5503 (cylinders) and Mil-V-5529A (valves) specify that the allowable leakage from a moving seal shall not be more than one drop in 25 cycles, at fluid temperatures between +70° and +130°F. (A cycle consists of one complete extension and retraction of a moving part.) This value holds for seals with less than 50,000 accumulated cycles, regardless of operating pressure.

There shall be no leakage from static (nonmoving) seals, regardless of the operating pressure.

These are the rules for evaluating hydraulic leaks; they're very simple and straightforward. The difficulty comes in knowing how to apply the rules. The danger is not so much that you will overlook a serious leak, as that you will spend a lot of maintenance effort, and perhaps down an aircraft, unnecessarily. A bad leak is pretty obvious; it's the marginal cases that have to be evaluated very carefully. It's possible for a unit to have the appearance of leaking unacceptably, when really it is not.

Be cautious when considering any accumulation of hydraulic fluid as evidence of an unacceptable leak. If the puddle is in a cavity on the outside of the unit, for instance, it may have collected there over a considerable period of time from an allowable leak. Or, two or more moving seals may leak to the same external cavity, thus multiplying the accumulated fluid. Before cycling such a unit to check for leakage, wipe the exterior completely dry. Also, to make a proper evaluation, it is necessary to know the number and arrangement of the internal seals, which ones move, whether and where they are vented, and so forth. To help you with this, cross-section drawings of many of the components are included in the HMI; others have been published in this magazine.

Another thing to watch out for is weepage. It is possible for a seal, especially a face seal, to leak enough to keep the outside of the unit slightly wet, but not enough to form distinct, countable drops. In some instances this may be all right. There is not much use trying to discuss the fine line between weepers and leakers; your own educated judgment will have to tell you what is acceptable and what is not.

Some other things can fool you, too. On static seal checks of a newly assembled component, for instance, oil used on the part during assembly may be squeezed out through the threads by O-ring extrusion during pressure application. Don't mistake this for a leak.

A newly installed component, or one which has not been exercised for some time, may leak excessively when first pressurized. The seals should have a chance to settle down before you decide whether they're satisfactory or not.

Finally, special light-squeeze O-rings are installed in certain applications to reduce friction, such as in the power control cylinder servo spools. These special installations may have different allowable leakage rates.

Don't get the idea from the above that we are advocating any relaxation of standards. We certainly don't want to go back to the old legendary system of classifying leaks as flyable or unflyable according to the number of shop towels it took to mop out the compartment. Modern specifications and good maintenance standards allow little or no leakage — 1 drop per 25 cycles for moving seals, nothing for static seals. But be sure it's real leakage that you're measuring. As someone recently said, "if it ain't broke don't fix it." — *McDonnell "Field Support Digest"*

Strut Servicing

THE following was taken from a recent aircraft incident report. "After launching . . . . . the pilot was unable to retract port main landing gear fully . . . . . . On rollout, port MLG was observed to shimmy excessively, and come to rest 17 degrees outboard. Investigation revealed a damaged port MLG strut stop sleeve caused primarily by . . . . . .

an improperly serviced strut."

This incident occurred on the aircraft's first flight after repair work had been performed on the MLG. Investigation revealed that, a structure mech bled air and hydraulic fluid from the port MLG to give the aircraft adequate overhead clearance for towing into a hangar bay with the nose strut on a dolly. Due to flight ops in progress, the man did this work in haste, failing to contact the Maintenance CPO to request a written work order. The man later forgot to report that he had bled the hydraulic fluid from the strut. *Consequently, when the strut was subsequently found to need servicing, it was merely pumped-up with air, leaving it hydraulically underserviced.*

Problems connected with proper strut servicing have plagued aircraft maintenance personnel for years. However, it has only been since the advent of the higher performance aircraft that the results of improperly serviced struts have proven so costly. The above incident is a case in point.

The Handbook of Maintenance Instructions for each model aircraft is explicit in every detail on the proper and only approved method of servicing aircraft struts. Squadrons which allow deviations from this publication and permit short cut methods in strut maintenance will inevitably end up with an incident or an accident. This has been proved time and time again.

In some cases the commanding officer or maintenance officer overlook these deviations on advice from their maintenance personnel who main-

WHY IS IT? NOMENCLATURE FOR THE FLIGHT HANDBOOK WHICH IS ALMOST A "HANDBOOK" WAS CHANGED TO FLIGHT MANUAL-YET THE HMI, A VOLUME LARGER THAN WEBSTER'S THIRD INTERNATIONAL DICTIONARY (UNABRIDGED) IS CALLED A HANDBOOK- OFFICIALLY, THE HANDBOOK OF MAINTENANCE INSTRUCTIONS.

tain that this is the only way to achieve an acceptable availability. Experience has shown that this is a false premise. Records clearly indicate that those squadrons which comply strictly with the HMI have equally good availability and, in the long run, do not expend more man-hours. The fact is: once the proper servicing procedure has been established, the need for servicing between major inspections is greatly reduced.

In short, those squadrons which *insist* on strut maintenance in accordance with the HMI have the best availability with less man-hours expended. In addition, they enjoy the best safety records. *—NavAirLant*

Hung Ordnance Tip

Ship's instructions require pilots to advise the tower during approach with hung ordnance. Tower then directs personnel to clear the deck forward. This procedure possibly prevented personnel injury when a hung rocket dislodged upon arrestment of an A-4 and traveled 200 feet up the deck into a parked aircraft.—USS CORAL SEA

Memorandum

From: Ordnance Officer
To: Aviation Safety Officer
Subj: Aviation Ordnance; Safety First! Not Last!

1. The paramount consideration in handling ammunition and explosives are Safety and Responsibility. The handling of all ammunition; arming and de-arming of aircraft shall be in an order. Operation and *speed of handling shall not be achieved at the expense of safety*.
2. Nothing will be gained in the training schedule if the following weeks are spent sending telegrams to next of kin, filling out accident forms, repairing holes in hangars, and attending Courts-Martial Boards.
3. Ordnance safety is a continuing problem. We have, since World War II and the Korean War, been endowed with a large group of highly qualified SCNOs and during this period ordnance accidents were few and far between. Now these fine Marines are fading away into retirement and many are working out of their MOS. Some of our squadrons are operating with less than half of the required number of SNCOs, yet weapons have become more sophisticated and turn-around times much more rapid. As a result many of our junior NCOs are performing jobs that tax their capabilities.
4. There is no substitute for experience. In handling any type of ammunition, the most experienced personnel must be used. Lacking personnel the task should be deferred until junior personnel can be properly trained. *Let the C.O. know your limitations.* MAJ R. L. WHITNEY, 3RD MAW

Don't Be a Hero

SOMEDAY it will happen to you. Someday you will be handed a job that is just a bit over your head. It may be a job you have never done before. Or something you helped with two or three years ago and haven't touched since. Perhaps it was covered in that course you took on systems, but that was back when your outfit got the new equipment. So you are not at all sharp on this particular job, but it has been given to you. Well, don't be a *hero*.

We were recently reminded of this hero business when a friend mentioned an accident that occurred a few years ago. It was a maintenance accident, an avoidable accident in which many people died. It was set up when a mechanic accepted a job he was not qualified to do, and it was triggered when he blundered ahead without telling anyone he neeeded help. He might have made out, but he never opened the HMI.

It is hard for us to understand this rushing in to save the day, this *hero* bit. It takes more guts to say you don't know than to clam up and hope no one discovers it. Actually, no one expects you to know all the details of a complex airplane.

It is much easier to use the help available — the manual and the experience of others — than to stumble along alone. Why take the hard way?

No bravery is required to gamble with the lives of others. If you want to bet your own life, OK, try drag racing or highway driving on a three-day weekend.

We have great compassion for the *heroes*. They are sadly mistaken and not too bright. They are afraid to confess their weaknesses to themselves. Probably they don't sleep very well.

Don't be a *hero*. Be an aviation mechanic.
—FSF Aviation Mechanics Bulletin

Did You Know

That tools for repairing spacecraft in a state of weightlessness must be specially designed? Using an ordinary wrench or screwdriver would rotate a crewman, while a welding torch would act like a rocket motor and would propel him out into space.

Worth the Effort

Here's a method of amplifying Continuing Action Maintenance Instructions (CAMIs) used by HU-1. Use of the method is based on the precept that a picture is worth 10,000 words. The squadron reports that by compiling CAMIs in this manner the time saved in resulting efficiency more than compensates for the effort to produce them. It's a great aid in training new men and in checking old hands out on new aircraft, says LCDR S. L. Bird, safety officer.

CPO F. L. Coombs states the method gives a mechanic all the information he needs without research on his part. This is done by having quality control check out all references on each CAMI, make reproductions of illustrations of the work area as depicted in the HMI or IPB, and mark the item to be checked or serviced (see

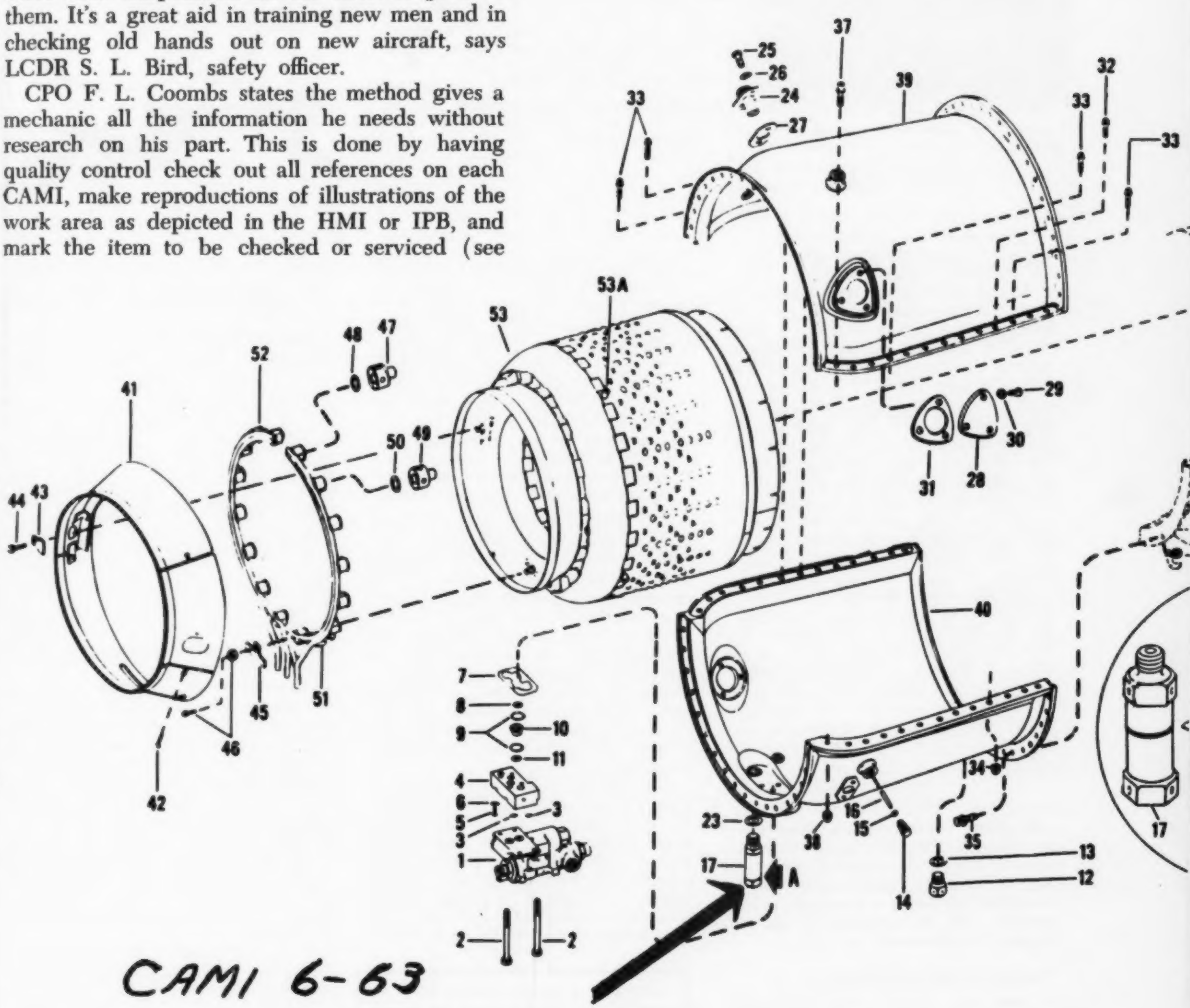


illustration). This is further backed up by a description of the inspection required, service to be performed, listing possible Murphys and follow-up action required such log book entries.

Amplifying CAMIs in this way reduces the possibility of accident investigators having 25 pictures made of the same maintenance area just because someone didn't know exactly what he should be checking, why, or proper corrective action, says Chief Coombs.

Letters

Want your safety suggestion read by nearly a quarter of a million people in naval aviation? Send your constructive suggestions to APPROACH.

Re Murgatroyd Frunch

MCAS, El Toro — As communication-electronics officer of aircraft, Fleet Marine Force, Pacific, I have noted a lack of general knowledge among communications personnel of IFF/SIF procedures. I have recently read the article "The Great Murgatroyd Frunch IFF/SIF Scandal" by LT Benjamin O. Bibb published in the February 1963 issue of APPROACH. The article is extremely well written and explains the system in simple and attractive form. Several copies have been previously reproduced locally but the demand has exceeded the supply.

Is there any method whereby a command could requisition perhaps 50 or 100 copies of the article? Do you have copies of the article available? If there is any such procedure which would eliminate the necessity of local reproduction and resultant poor copy, I would appreciate any information you could send me on the subject.

CLAYTON O. BUSH
MAJOR, USMC

• Fifty copies are on their way. Commands are encouraged to make use of APPROACH material for training of personnel. Back copies can be furnished on many issues and specific articles will be reprinted if the demand is sufficient.

Tech Library Control

FPO New York — The December issue of APPROACH, article "Quality Control," page 36 states quote "Personnel in the Quality Control Division should not be straddled with day-to-day tasks such as running a Tech Pubs Library." BuWeps 4700.2, p. 1007 has placed the Technical Library under the management and operations of the Quality Control Division. I may add it functions extremely well this way. This article implies that probably Maintenance Control Division should run the library. It is a strong belief that 4700.2 wants the Quality Control Division to be in complete control of the library including its operations.

H. V. CORNELL, LT
ASSISTANT MAINTENANCE OFFICER
VR DETACHMENT

• You are correct in your belief that BuWeps wants the tech library under the Quality Control Division. BuWeps Inst. 4700.2 states: "The management of the Technical Library is a function of the Quality Control Division. This function includes the determination of publications requirements for the maintenance organization, the receipt, distribution and control of these publications and the responsibility for updating procedures throughout the maintenance organization."

Your inference that the author implied library control to be a function of Maintenance Control Division is open to question. The tone of the article seems to imply more that talent and knowledge of a good quality controller is more effective on deck than being straddled with running a library per se. In other words, junior or lesser experienced individuals may be put to good use there, under qualified supervision of course.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Oral Inflation of Anti-G Suit

Monterey, Calif. — Your footnote to the article "Swimming Success" in the December 1963 APPROACH states that a survivor should unzip the legs of his anti-G suit before orally inflating it. If this procedure is followed, the lower-leg air bladders will be free to float on the surface of the water. As air is blown into the suit, the bladders floating on the surface will inflate first, and they must fully inflate before air is forced into the submerged bladders. Since buoyancy is provided only when water is displaced, the air trapped in any bladders above the water surface is of no direct benefit.

As an alternate procedure, the anti-G suit can be inflated without unzipping the legs. Following this procedure, air blown in would initially remain in the torso bladder thus providing immediate buoyancy. Only after sufficient air is blown in so that the air pressure in the anti-G suit equals the water pressure at the leg bladders level would the leg bladders begin to inflate. The lower leg bladders, which in this case would tend to cause instability, would be the last to inflate.

I have personally used this latter procedure both in practice and in a survival situation with no adverse instability. Since a pilot in the water normally resorts to inflating his anti-G suit only when he needs *immediate* buoyancy, which the first procedure does not provide, I submit that from buoyancy considerations alone the second procedure is better.

Additional benefits provided by the second procedure are:

• Omission of the possibly difficult and time-consuming step of completely unzipping the leg zippers. This is tough enough in the readyroom, let alone in the sea with a mouthful of salt water.

• Retention of leg insulation.

• Reduction of the possibility of chute entanglement and annoyance caused by floating bladders.

Counter arguments would be appreciated.

JAMES B. ANDERSON, LT

• The case *for* unzipping the legs of the anti-G suit before inflating it orally for flotation is 1) it is easier to inflate the bladders orally in the air than under the water; 2) buoyancy is needed under the torso, not on the legs, and unzipping puts the leg bladders where you can hold them under your arms; and 3) you won't get full inflation of the bladders unless you unzip the legs.

BACSEB 61-61 on anti-G equipment says if the coverall is worn as the outermost garment, unzip both legs, then inflate.

In your case we can't argue with past success but our advice to other pilots and RIOs who are wondering about the same thing is to put on their anti-G suits and try oral inflation both ways in the station pools. We think everyone will agree, however, that the best thing to do in the first place is to preflight your flotation gear carefully so that you will increase the odds against finding yourself in a spot where you have to rely on your anti-G suit for flotation.

Happy Turn

Fort Benning, Ga. — This headquarters requests permission to reprint the article, "Unhappy Turn" which appeared in the February, 1962 issue.

This article written by Lieutenant Commander J. T. Gilstrap was instrumental in saving a UH-1 aircraft of this command from probable damage. This article was read, and the procedures applied during an actual tail rotor failure by Captain James A. Wall, Headquarters and Headquarters Company, 11th Aviation Group. The aircraft was landed successfully without damage.

A forthcoming aviation safety bulletin is to be published by this headquarters. It is desired to include and disseminate the information in the "Unhappy Turn" to all members of this command.

MALCOM R. BAER, LTCOL, U.S. ARMY

• Print away! Also see "Lost Tail Rotor" page one.

Don't Fight It!

Safety (one of my favorite subjects) was well treated in Capt. Ivy's excellent article and should be much discussed in view of it. However, I feel I must take exception to the paragraph "In War and Peace."

I know of no man in naval aviation who will not extend himself beyond the realm of normal safety, given sufficient justification — not necessarily combat! How many of us have flown past normal fatigue limits on an SAR mission, looking for a downed birdman? How many of us have shot off the cat during an ORI with normally downing gripes? How many Compex and Bomber Streams are flown with down radar? bad radios? hydraulic leaks? low struts? There would have been many less CAS hops flown in Korea (both Marine and Navy) had we worried more about the guy on the line!

I am not knocking safety. I'd *much* rather be safe than sorry. I simply disagree and will continue to act accordingly.

ANYMOUSE

• Thank you muchly for your views on this highly controversial issue. I do believe, however, that you may have missed the point of the paragraph or are reading something between the lines that isn't there.

Safety and mission readiness are not opposites. They must become molded into one strong, persistent effort.

Take Another Look

FPO San Francisco — The NASC Weekly Summary of 30 December 1963 to 5 January 1964 was received here in the "Pearl of the Orient" on 23 January 1964. Page four advises that the first six months of fiscal year '64 produced the rate of 1.38 accidents per 10,000 flight hours.

As a plank owner of NASC circa 1954, I can still recall the objections, based on "It will *never* go that low," that greeted us when we proposed the slogan, "3.5 in '55." I wonder how those who objected then react now to naval aviation's magnificent achievement of 1.38. . .?

A. H. REID
CAPTAIN, U. S. NAVY

Signed, Sealed —Undelivered

Pax River — A preflight checklist used here triggered the discovery of a misrigged Martin-Baker seat drogue chute withdrawal line. This maintenance goof was found on an F8C just out of major inspection with all paperwork completed and signed off.

Drogue chute withdrawal line routed under instead of over the Y-link line. This situation will foul the ejection sequence precluding successful low-level escape.

I'm forwarding this information to emphasize the importance of knowing and inspecting each ejection seat prior to flight.

D. L. VARNER, LCDR

Here's the checklist. Note the first item:

F-8

Points for quick check by pilot on Martin Baker Seat.

1. Drogue chute withdrawal line on top of all other lines and harness.

2. Drogue gun trip rod attached to bulkhead behind seat (left side of seat). 47

3. Time delay mechanism trip rod attached to bulkhead behind seat (right side of seat).

4. Chute restraint straps correctly attached but not too tightly (should not compress head rest pad).

5. Parachute withdrawal line (link line) routed thru guillotine cutter.

5a. Insure that parachute withdrawal line fitting is completely screwed together.

6. Insure that bailout bottle is full.

7. Insure that bailout bottle actuation cable and pilots services disconnect cable are attached to aircraft.

8. Seat pan straps (lap belts) securely attached to seat and sticker clips in place.

9. Make sure that all six safety pins have been pulled and stowed in pocket on left side of seat:

a. drogue gun pin. (ALL
b. face curtain pin. three
c. main cartridge sear pin. joined.)

---

d. secondary firing handle pin.
(Both are
e. guillotine cutter pin. joined.)

---

f. canopy pin. (Separate pin.)

10. Insure that primary and secondary firing handles are in correct position.

11. Leg restraint lines not fouled on anything or wrapped around anything prior to reeving through garters.

approach

NavWeps 00-75-510 VOL. 9. NO 10

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Flight Operations

Aero Medical

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Departments

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SURPRISE!

There are many definitions of the word "accident." Webster says it is "an event that takes place without one's foresight or expectation, especially one of an afflictive or unfortunate character . . ." Someone else defined it as "an unpredictable and unexpected interruption of an orderly process."

But whether we use these definitions, or any of a dozen others, it is generally accepted that there is an element of genuine *surprise* in all bona fide accidents. For example, we can hardly be surprised or claim an accident if we allow children to play with loaded weapons and someone gets hurt — or if children injure themselves in an environment we knew was unsafe. The same is true on the job:

- If we smoke or permit others to smoke in hazardous areas, fires should come as no surprise.
- If we continue to use equipment with known defects, it should come as no surprise when injury or damage results.
- If we indulge in risky shortcuts — if we permit or commit unsafe acts — if we neglect to use prescribed safety devices and personal protective equipment — injuries and damages will occur, but they will come as no surprise and they won't be accidents.

We will merely be witnessing foreseeable events which we were sure would happen eventually — and which finally did.

Most unsafe acts and unsafe conditions are not hard to detect. Correct them promptly and unfailingly and you will be *surprised* at how few real *accidents* will occur.

— *National Safety Council*

THE CRUELEST CUT OF ALL

"Investigation into the . . . pilot's history revealed that . . . on numerous occasions he had been cautioned as to his abrupt clearing turns, nose-high takeoffs, rushed rendezvous, exaggerated waveoffs and in general, lack of good air discipline.

"Because of LT*————'s past performance the board feels some doubt as to whether the premature gear retraction was inadvertent or an attempted high speed takeoff. It is well to note that if a pilot continuously attempts to hurry the mechanical motions involved in takeoffs, landings, etc., he will condition his responses so that he need not consciously think of his actions. This apparently was the case."